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Taxonomic studies of Australian *Senecio* (Asteraceae): 4. A revision of *Senecio glossanthus* and recognition of an allied species with long ligules

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Abstract

A morphological study of the Australian annual daisy *Senecio glossanthus* (Sond.) Belcher has resulted in the recognition of three new species: *S. halophilus* I.Thomps., *S. serratifornis* I.Thomps., and *S. productus* I.Thomps. Two new subspecies are also described: *S. productus* subsp. *magnus* I.Thomps. and *S. serratifornis* subsp. *stenophyllus* I.Thomps. A further new species, *S. condylus* I.Thomps., described here, has features in common with the *S. glossanthus* group but also has some affinity to the Australian *S. lautus*/*S. pinnatifolius* complex. A key, distribution maps and illustrations of the new taxa are presented.

Introduction

Senecio glossanthus (Sond.) Belcher is a small radiate annual daisy endemic to Australia. It occurs predominantly in low rainfall and/or saline environments across the southern half of the mainland. It is characterised by very small ligules and dimorphic achenes. It was first described as *Erechtites glossantha* Sond. in 1853. Benth (1867), when transferring this species to *Senecio*, gave it the illegitimate name of *S. brachyglossus* F.Muell. ex Benth. and described two varieties, var. *major* Benth. and var. *elatior* Benth. Belcher made the correct combination of *Senecio glossanthus* in 1956.

The variety *elatior* was prefixed with a '?' by Benth, presumably to indicate his uncertainty about the nature of the type specimen from the Blue Mountains, New South Wales. Examination of the isotype at MEL has, in fact, shown it to be a hybrid of the disciform species *S. bipinnatisectus* Belcher and the radiate species *S. linearifolius* A.Rich. Hybridisation has been recorded between other radiate and disciform species in Australia. A not infrequent sterile hybrid between *S. lautus* Forst.f. ex Willd. *sensu lato* (alternatively *S. pinnatifolius* A.Rich.) and *S. biserratus* Belcher has been recorded; it was first described as *S. orarius* J.M.Black by Black (1928) and subsequently shown to be a hybrid based on karyotypic studies by Lawrence (1980). A hybrid of *S. linearifolius* A.Rich. var. *linearifolius* and *S. minimus* Poir. has been investigated in Victoria (Thomas, 2004), and herbarium material from HO indicates that these species hybridise in Tasmania. Such hybrids can be distinguished from *S. glossanthus* and related species described in this paper as the ligules of these hybrids are often more than 2.5 mm long and their achenes are homomorphic and sometimes sterile. They are likely to be in close proximity to the parent species.

Examination of the numerous specimens collected and determined as *S. glossanthus* (hereafter the Glossanthus Group) has led to the identification of three new species. Two of the new species have dimorphic achenes like typical *S. glossanthus*, while the other has homomorphic achenes.

Another new species described here, *S. condylus* I.Thomps., is considered to be related to the Glossanthus group, although similarities in capitular morphology and ligule length have in the past caused specimens to be placed with the *S. lautus*/*S. pinnatifolius* complex. The marked achenial dimorphism of *S. condylus* corresponds to the dimorphism seen in three species of the Glossanthus group. It is also similar in habit, and in leaf and

phyllary morphology. Although achenial dimorphism does occur in some members of the *S. laetus* complex, it is less pronounced.

Achenial dimorphism is a complex syndrome and contains the following elements: achenes of female florets up to 20% longer, and slightly broader, than those of bisexual (disc) florets; papillose hairs more robust, whiter, and obscuring the surface of the achenes more fully; carpopodium of the female florets forming a larger ring; and thickened and often protruding attachment points developed on the receptacle for the female florets (Figs 1a–c., right; Fig. 9). In addition, the achenes of female florets tend to fall from the receptacle more tardily, and usually the pappus of these achenes is more poorly developed and/or very early caducous.

Materials and Methods

Herbarium specimens from AD, BRI, CANB, DNA, MEL, and PERTH were examined. Field observations and collections in Victoria supplemented the herbarium data. The circumscriptions of, and morphological variation within, previously recognised taxa was critically assessed and new taxonomic concepts developed and tested when the taxonomy was found wanting. Distribution maps were generated using the ArcView computer program.

Glossary of some terms used in keys and descriptions

Bands or lines (of papillose hairs on achenes): The bands or lines run longitudinally following the ribs and grooves, with bands being broader than lines. The hairs themselves are also oriented $\pm$ longitudinally and are appressed to divergent.

Diameter of the involucre: The measurement given is for live specimens measured around the middle of the involucre at or around anthesis. Pressing produces a larger 'diameter' (by up to 50%) and will obviously be variable according to the severity of pressing.

Dimorphism associated with achenes: This syndrome is described in the Introduction; see also fig. 1).

Divided leaves: Leaves with major sinuses extending more than 50% towards midline (includes lobate and pinnatisect).

Lageniform (of achenes): Bottle-shaped, i.e. the distal third of the achene more tapered and narrower than the proximal third.

Pappus ring: A slender rim of pale tissue at the summit of the achene to which the pappus bristles attach. The body of the achene narrows shortly below its apex and then dilates as it connects to the pappus ring. The pappus ring is variably obscured and exceeded by hairs arising from the body of the achene.

Unit inflorescence: The cluster of capitula at the end of primary stems and branches where all the supporting branches are leafless. Species commonly develop secondary inflorescences and these are defined by the presence of leaves along the primary axis of these inflorescences.

Key

The following key discriminates the *Glossanthus* group from *S. condylus* and members of the *S. laetus*/*S. pinnatifolius* complex. A key to all radiate species is presented in Thompson 2004 and a key to a revised *S. laetus*/*S. pinnatifolius* complex is presented in Thompson (2005b).

- 1 Calycular bractcoles 2–6; involucre with length: diam. ratio 1.5–4; ligule < 2.5 mm long (sometimes vestigial).....**Glossanthus group**
- 1: Calycular bractcoles 5–16; involucre with length: diam. ratio 0.8–1.5; ligule > 4 mm long

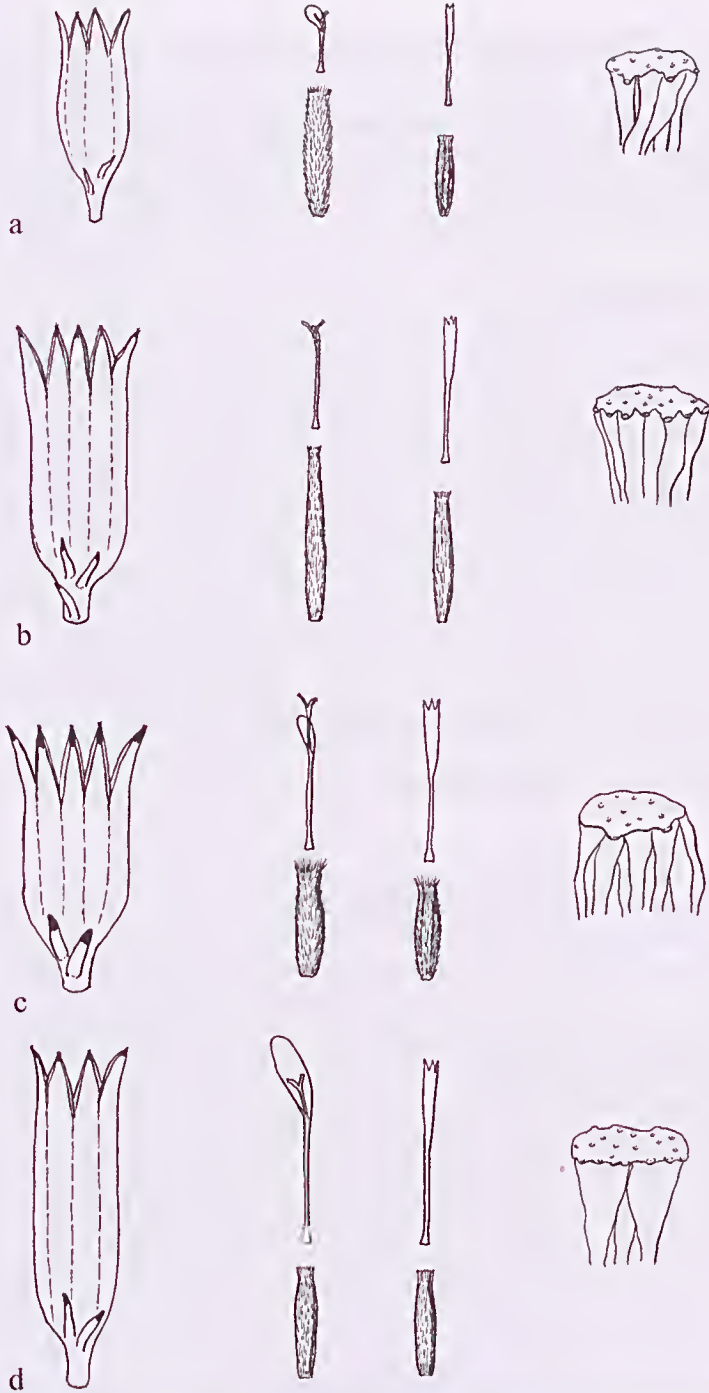


Figure 1. a. *S. glossanthus* (from N.G. Walsh 5820 MEL); b. *S. productus* subsp. *productus* (from A.C. Beauglehole 64354 MEL); c. *S. halophilus* (from I.R. Thompson 674 MEL); d. *S. serratifolius* (from J.Z. Weber 6267 AD; receptacle from E.J. Carroll SA/65 516 AD). From l to r: capitulum (excluding florets); female floret: corolla with exserted style branches and achene; bisexual floret: corolla and achene; mature receptacle. The capitula are shown as they present when lightly pressed (in live material the involucre narrows slightly from base to apex at anthesis). 5 times actual size.

- 2 Achenes dimorphic, with achenes of female florets c. 1 mm longer than those of bisexual florets; bracteoles and phyllaries strongly pigmented in distal 1–1.5 mm 5. *S. condylus*
- 2: Achenes homomorphic, or mildly dimorphic with achenes of female florets hardly longer than those of bisexual florets, or if clearly longer than bracteoles and phyllaries with pigmented zone < 0.5 mm long and often rather faint*S. lantus*/*S. pinnatifolius* complex

The Glossanthus Group

Erect annuals to c. 0.5 m tall, tap-rooted, nearly glabrous or with scattered coarse multicellular hairs. *Leaves* divided or not; margin usually with some teeth. *Unit inflorescences* of few–25 capitula; mature peduncle mostly 5–25 mm long. *Capitula* radiate, or pseudo-disciform with ligule hardly developed; calycular bracteoles 2–6, narrow-ovate to lanceolate, 0.8–3.0 mm long, 0.3–1.0 mm wide, with margin glabrous or nearly so; involucre 3.0–8.0 mm long, 1–3 mm diam.; phyllaries 7–13, rarely as few as 5 in a minority of capitula, free; stereome $\pm$ flat, thin to slightly fleshy, glabrous, with resin ducts fine or prominent, pale or orange; attachment points on mature receptacle for achenes of female florets usually prominent, or not in *S. serratifolius*. *Florets* 8–40; female florets (4–)5–13; ligule to 2.5 mm long, sometimes vestigial, yellow; tube shorter or longer than the mature achene; corolla-limb of bisexual (disc) florets slightly shorter than tube. *Achenes* dimorphic*, or homomorphic in *S. serratifolius*, narrow-obloid, 2.0–5.5 mm long, with ribs $\pm$ flat, moderately to densely papillose-hairy, with l:w ratio of hairs 3–8. *Pappus* 2–4 mm long, caducous; bristles nearly smooth or minutely scabridulous.

*syndrome described at end of Introduction

Key to Glossanthus Group

- 1 Achenes all similar in length; attachment points on receptacle not dimorphic as below; corolla-tube of female florets distinctly longer than the mature achene 4. *S. serratifolius*
- 1: Achenes of female florets longer than those of bisexual florets; attachment points on receptacle for achenes of female florets thickened and usually projecting (in contrast to attachment points for bisexual achenes); corolla-tube of female florets shorter than or equal to the mature achene
 - 2 Phyllaries 12 or 13 in a majority of capitula; female florets 8–13; achenes of female florets 3–6 mm long, slightly lageniform 2. *S. productus*
 - 2: Phyllaries 7–10, or occasionally to 13, in a majority of capitula; female florets predominantly 4–8; achenes of female florets 2–3.5 mm long, not lageniform
 - 3 Involucre 3.5–6 mm long; calycular bracteoles 0.2–0.5 mm wide; mature receptacle 1–2(–2.5) mm diam.; ligules generally exceeding involucre; hairs on achenes of bisexual florets 0.05–0.15 mm long, barely exceeding pappus ring 1. *S. glossanthus*
 - 3: Involucre 5–7 mm long; calycular bracteoles 0.5–1 mm wide; mature receptacle mostly 2–3.5 mm diam.; ligules not exceeding involucre; hairs on achenes of bisexual florets 0.2–0.3 mm long, clearly exceeding pappus ring... 3. *S. halophilus*

1. *Senecio glossanthus* (Sond.) Belcher, *Ann. Missouri Bot. Gard.* 43: 80 (1956)

Erechtites glossantha Sond., *Linnaea* 25: 524 (1853); *S. brachyglossus* F.Muell. ex Benth., *Fl. Austral.* 3: 670 (1867), *nom. illeg. non* Turcz. (1851). Type: South Australia,

near Adelaide ['Ad agros prope urbem Adelaide'], July 1848, *F. Mueller*; lecto (here selected: MEL 2168154.)

Herbs to c. 0.3(–0.5) m tall, with scattered hairs usually developed on stems and leaves, glabrescent. *Mid-stem leaves* mostly 1–7 cm long, undivided or lobate to sub-pinnatisect; base attenuate to cuneate or becoming cordate upwards, mildly stem-clasping; margin entire, denticulate or dentate; undivided leaves $\pm$ linear or very narrow-elliptic; divided leaves with 1–3 segments per side. *Upper-stem leaves* often with base cordate, mildly stem-clasping. *Capitula*: calycular bracteoles 0.8–1.5 mm long, 0.2–0.5 mm wide, with brown apical mark to c. 0.3 mm long; involucre 3.5–6 mm long, 1–2(–2.5) mm diam.; phyllaries 7–10, sometimes a minority with 5 or 6 or 11–13, with resin ducts very fine, pale; inner phyllaries with margin 0.2–0.3 mm wide; outer phyllaries with margin hardly developed; receptacle 1–2 mm diam. at maturity, with attachment points for achenes of female florets tubercle-like. *Florets* 8–30; female florets (4–)5–8; corollatube 1.5–2 mm long; ligule 1–2 mm long, usually exceeding phyllaries; corolla of bisexual florets 3–4 mm long. *Achenes* narrow-obloid, dimorphic; achenes of bisexual florets 1.8–3 mm long, with papillose hairs covering c. 50–90% of the otherwise light to dark brown surface, minutely exceeding pappus ring; achenes of female florets 2.3–3.5 mm long, usually completely covered by more robust, papillose hairs; hairs clearly exceeding pappus ring, not or slightly divergent. *Pappus* 3–3.5 mm long, absent from mature achenes of female florets. (Fig. 1a, 3)

Flowers mostly winter and spring.

Distribution and Habitat: Occurs in southern Western Australia, South Australia, western New South Wales, and north-western Victoria (Fig. 2a). Grows in seasonally wet areas, on gilgai plains and clay pans, on clay, clayey sand, or sand over granite, laterite, or limestone, in shrubland and low woodland.

Notes: Sonder cited two syntypes of *Erechtites glossanthus*, one from Gulf St. Vincent and the other from near Adelaide. The former contains two plants with flowering capitula but without mature achenes. Although the specimens are imperfect, I consider them most likely to be specimens of *S. halophilus* L. Thoms. The syntype from Adelaide corresponds to the very widespread and common form of *S. glossanthus sensu lato* and is here selected as the lectotype of *E. glossanthus*.

Senecio glossanthus is a very widespread species, predominantly of semi-arid areas. Lawrence (1980) identified two chromosome forms, a tetraploid $2n = 40$ and an octoploid $2n = 80$, and indicated that there was a correlation between chromosome number and leaf morphology. This correlation was unable to be confirmed. A possible hybrid, based on the intermediate length of the ligules, of *S. glossanthus* and *S. pinnatifolius* s. lat. has been collected from the Redcliff survey area in South Australia (*R. Chumock* 1582, AD). *Senecio glossanthus* can be distinguished from perhaps the most similar member of the Glossanthus group, *S. halophilus*, by the generally smaller capitula with fewer phyllaries and florets, smaller mature receptacle, narrower and less pigmented calycular bracteoles, ligules exceeding the phyllaries, achenes of bisexual florets with hairs hardly exceeding the pappus ring, and the more prominent tubercles on the receptacle.

Selected specimens examined: **WESTERN AUSTRALIA**: c. 2.5 km south of Binmu, *P.S. Short* 2857, *M. Amerema*, & *B.A. Fuhrer*, 11.ix.1986 (AD, CANB, MEL, PERTH). **NORTHERN TERRITORY**: New Crown Station, Beddome Range, *P.K. Latz* 12512, 19.viii.1992 (DNA). **SOUTH AUSTRALIA**: Eyre Peninsula District: Corunna Hill South, 4.9 km NW of Iron Knob, *J.D. Briggs* 973, 22.viii.1983 (AD, CBG, MEL). **QUEENSLAND**: Lake Bindegolly National Park, 4 km N on Bulloo Development Road, 200 m E of Lake, *M. Handley* 197, 28.vi.1995 (BRI). **NEW SOUTH WALES**: Vacant lot opposite fuel depot, Bourke, *B. Wiecek* 68, *R. Coveny* & *P. Cuneo*, 19.viii.1987 (AD, BRI, CANB, HO, MEL, NSW). **VICTORIA**: Big Desert ca. 44 km N of Broken Bucket bore & ca 46 km S of Murrayville on road to Nhill, *M.G. Corrick* 6353, 1.x.1979 (MEL).



Figure 2. Distribution of a. *S. glossanthus*; b. *S. productus* subsp. *productus*; c. *S. productus* subsp. *magnus*; d. *S. halophilus*; e. *S. serratifomis* subsp. *serratifomis*; f. *S. serratifomis* subsp. *stenophyllus*.

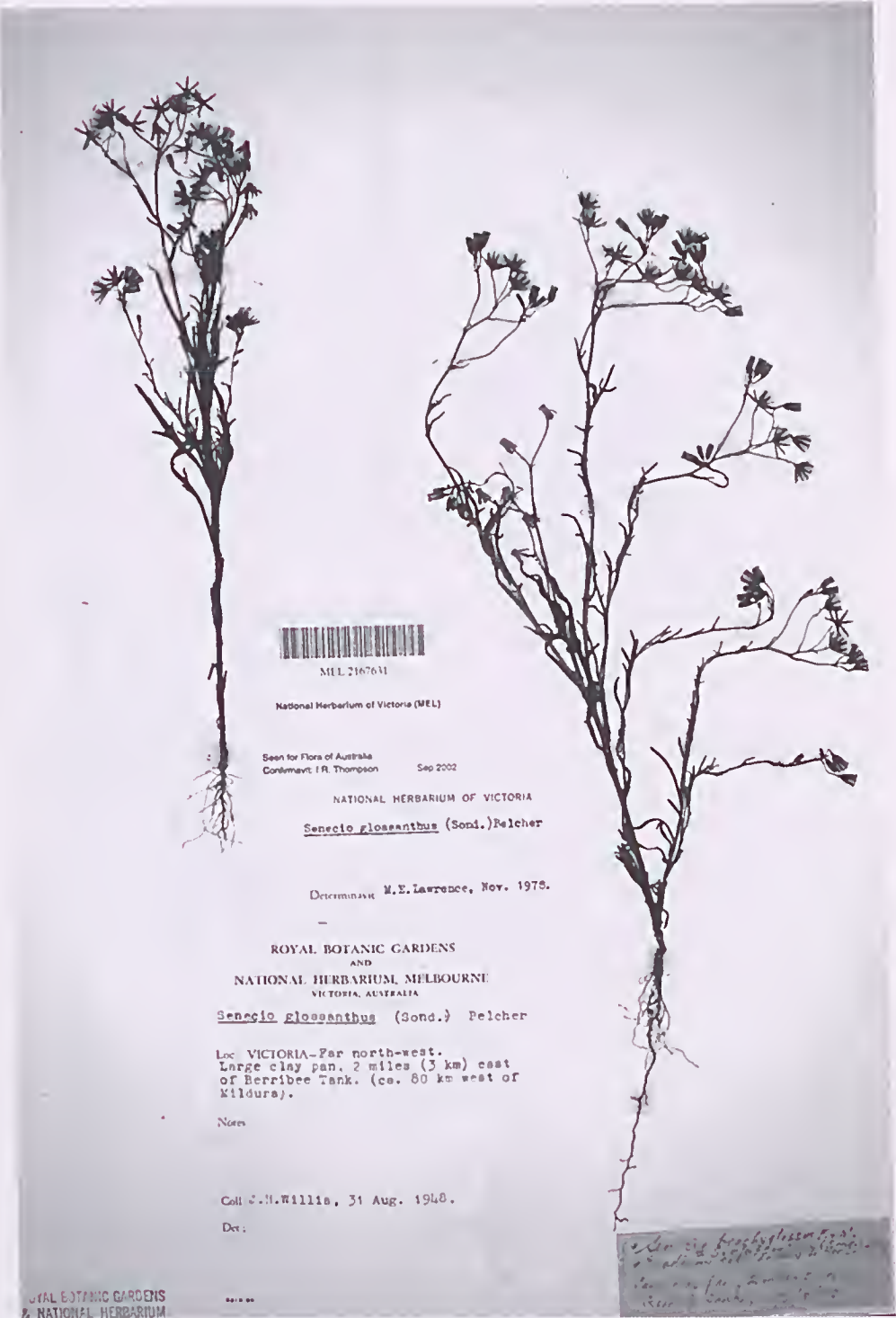


Figure 3. *S. glossanthus* (J.H.Willis 31.viii.1948 MEL)

2. *Seuccio productus* I.Thomps., *sp. nov.*

A. S. glossantho (Sond.) Beleher flosculis pluribus, capitulis et acheniis longioribus differt.

Type: Victoria, 7.5 km E of Kerang Post Office, A.C. Beanglehole 64354, 2 Sept. 1979; *holo:* MEL.

Herbs to c. 0.3 m tall, glabrous or nearly so. *Mid-stem leaves* mostly 2–7 cm long, undivided or lobate to sub-pinnatisect; base attenuate; margin entire, denticulate or dentate; undivided leaves linear or very narrow-elliptic; divided leaves with up to 3 segments per side. *Upper-stem leaves* with base sometimes shallowly auriculate, hardly stem-clasping. *Capitula:* calycular bracteoles lanceolate, 1.0–2.0 mm long, 0.3–0.6 mm wide, with purple apical mark c. 0.5 mm long purple, or hardly developed; involucre 4.5–7.0 mm long, 1.8–3 mm diam.; phyllaries 12 or 13, or sometimes a minority with 10 or 11, with resin ducts moderately developed, pale to orangish; inner phyllaries with margin 0.2–0.3 mm wide; outer phyllaries with margin to 0.1 mm wide; receptacle 2–3.5 mm diam. at maturity, with attachment points for achenes of female florets tubercle-like. *Florets* 25–45; female florets 8–13; corolla-tube 2–3 mm long; ligule c. 1 mm long or vestigial, exceeding phyllaries or not; corolla of bisexual florets 3–4 mm long. *Achenes* slightly lageniform, dimorphic; achenes of bisexual florets 2.5–4.5 mm long, with papillose hairs covering c. 50–90% of the otherwise light to dark brown surface, shortly exceeding pappus ring; achenes of female florets 3–6 mm long, otherwise similar to achenes of bisexual florets. *Pappus* 3–4 mm long, absent from mature achenes of female florets.

Flowers mostly winter and spring.

Etymology: The epithet alludes to the achenes which are elongated relative to those of *S. glossanthus* (L. *productus*, extended).

There are two subspecies.

Ligule vestigial; achenes of female florets < 4.5 mm long.....2a. subsp. *productus*
Ligule c. 1 mm long; achenes of female florets > 4.5 mm long.....2b. subsp. *uaguus*

2a. *Seuccio productus* I.Thomps. subsp. *productus*

Phyllaries 5–6 mm long. *Female florets* with ligule vestigial. Achenes of bisexual florets 2.5–3.5 mm long; achenes of female florets 3–4.5 mm long. (Fig. 1b, 4)

Distribution and Habitat: Occurs on plains of the Murray River catchment in far south-central New South Wales, north-central and north-western Victoria and in far south-eastern South Australia (Fig. 2b). Recorded from heavy, grey clay soils, from the edge of a billabong in drying mud, and from chenopod shrubland.

Notes: Similar to *S. glossanthus* but the latter has narrower capitula with fewer phyllaries, fewer but better developed and exerted ligules, and shorter achenes. Because the ligules of this subspecies are vestigial, it could be confused with disciform or discoid species of *Senecio* unless the florets were examined microscopically. Recorded as growing together with *S. glossanthus*.

Selected specimens examined: **SOUTH AUSTRALIA:** Murtho Forest, R. Bates 18421, 15.v.1989 (AD). **NEW SOUTH WALES:** 15 miles [24 km] north of Deniliquin. W.E. Mulham, 17.ix.1963 (MEL). **VICTORIA:** Neds Corner Station, beside access road, 7.5 km due N from Sturt Hwy at Meringur North, N.G. Walsh 5778 & I.R.K. Sluiter, 9.x.2003 (MEL).

2b. *Seuccio productus* subsp. *uaguus* I.Thomps., subsp. *nov.*

A subspecies typica capitulis longioribus, ligulis majoribus, acheniis longioribus differt.

Type: South Australia, 0.5 km NW of Strathearn Homestead near wet clay pan, L.D. Williams 9968, 23 Aug. 1978; *holo:* AD.



Figure 4. *S. productus* subsp. *productus* (holotype: A.C. Beauglehole 64354 MEL).



Figure 5. *S. productus* subsp. *magnus* (holotype: L.D. Williams 9968 AD).

Phyllaries 5.5–7 mm long. *Female florets* with ligule c. 1 mm long. *Achenes* of bisexual florets 3.5–5 mm long; achenes of female florets 4.5–6 mm long. (Fig. 5)

Etymology: The epithet refers to the larger capitula and achenes in this variety (*L. magnus*, large).

Distribution and Habitat: Known only from the type locality in far eastern South Australia, where it grew adjacent to clay pans (Fig. 2c).

Notes: Known only from the type specimen. Although only apparently differing in the size of reproductive structures, this size difference is substantial. The ligule of the female florets is also larger in this subspecies.

3. *Senecio halophilus* I.Thomps., *sp. nov.*

A *S. glossanthus* (Sond.) Belcher phyllariis plerumque pluribus, tuberculis receptaculorum minoribus, ligulis phyllaria non superantibus, bracteolis latioribus, papillis acheniorum longioribus differt.

Type: Victoria, Northern extremity of Lake Corangamite, south side of Foxhow Road, 2 km west of Foxhow, I.R. Thompson 676, 21 Sept. 2001; holo: MEL; iso: AD, CANB, HO.

S. brachyglossus F. Muell. ex Benth. var. *major* Benth., *Fl. Austral.* 3: 670 (1867). *Type*: Point Nepean, F. Mueller; lecto (here selected): K (photo seen MEL). [The third syntype cited, from Wilsons Promontory, has not been seen; however, R.O. Belcher (1956) considered that it was not *S. glossanthus* s. lat.]

Herbs to c. 0.4 m tall, with scattered hairs usually developed, glabrescent. *Mid-stem leaves* 2–7 cm long, undivided or lobate to sub-pinnatisect; base becoming slightly cordate upwards, mildly stem-clasping; margin entire, denticulate or dentate; undivided leaves narrow-elliptic to oblanceolate; divided leaves with up to 3 segments per side. *Upper-stem leaves* auriculate, somewhat clasping. *Capitula*: calyular bracteoles narrow-ovate to lanceolate, 1–2 mm long, 0.5–1.0 mm wide, with purple apical mark 0.4–0.8 mm long; involucre 5–7 mm long, 2–3.5 mm diam.; phyllaries 8–13, with resin ducts often well-developed, usually pale on drying, inner phyllaries with margin c. 0.3 mm wide; outer phyllaries with margin c. 0.1 mm wide; receptacle 2–3.5 mm diam. at maturity, with attachment points for achenes of female florets slightly raised or tubercle-like. *Florets* c. 15–30; female florets 5–8; corolla-tube 2–3 mm long; ligule up to 1 mm long or vestigial, not usually exceeding phyllaries; corolla of bisexual florets 3–5 mm long. *Achenes* narrow-obloid, dimorphic; achenes of bisexual florets 2–3 mm long, light to dark brown, with papillose hairs robust, obscuring c. 50–100% of surface, clearly exceeding pappus ring and distinctly divergent at summit; achenes of female florets 2.5–3.5 mm long, otherwise similar to achenes of bisexual florets. *Pappus* 3–4 mm long, absent from mature achenes of female florets. (Figs 1c, 6)

Flowers mostly winter and spring.

Distribution and Habitat: Occurs in south-central and south-eastern South Australia and western and south-central Victoria (Fig. 2d). Grows in predominantly saline environments at margins of inland lakes and in coastal areas.

Notes: Similar to *S. glossanthus* but with larger capitula and the achenes of bisexual florets with markedly longer papillose hairs. These hairs are distinctly divergent at the summit of the achene. A specimen from Marion Bay on the Yorke Peninsula has relatively large capitula (involucre 6.5–7 mm long). The syntype of *S. brachyglossus* var. *major* collected from Point Nepean is likely to be this species based on its general appearance and distribution. However, definitive diagnosis requires microscopic examination of capitular characters.

Senecio halophilus is likely to be more common and widespread than is indicated in the distribution map.

Selected specimens examined: **SOUTH AUSTRALIA:** Yorke Peninsula, Marion Bay, R.J. Bates 38588, 21.ix.1994 (AD); Hindmarsh Island, D.E. Murfet 2508, 24.viii.1996 (AD, MEL). **VICTORIA:** Sandringham, C. French Jr, May 1900 (MEL); Mitre Lake Flora and Fauna Reserve, A.C. Beaglehole 86508, 11.xi.1986 (MEL); Lake Goldsmith, eastern shore, N.G. Walsh 5246 & A. Brown, 8.xi.2000 (MEL).

4. *Senecio serratifolius* I.Thomps., *sp. nov.*

A *S. glossantho* (Sond.) Belcher phyllariis longioribus, acheniis homomorphis, achenio quam tubo corollae brevior differt.

Type: South Australia, Eyre Peninsula, Fowlers Bay, just north of jetty, J.Z. Weber 6267, 15 Aug. 1980; *holo:* AD.

Herbs to c. 0.3 m tall, ±glabrous except for scattered hairs on newer growth. *Mid-stem leaves* mostly 2–6 cm long, undivided or coarse-dentate; base attenuate to cuneate, sometimes becoming cordate upwards; margin with scattered to crowded denticulations or teeth; undivided leaves narrow-elliptic to oblanceolate; coarse-dentate leaves with up to 5 major teeth per side. *Upper-stem leaves* with base often cordate, mildly stem-clasping. *Capitula:* calycular bracteoles lanceolate, 1.0–2.5 mm long, 0.3–0.5 mm wide, with purple apical mark c. 0.5–1 mm long; involucre 5–8 mm long, 2–2.5 mm diam.; phyllaries 8–10, sometimes a minority with 13, with resin ducts fine, pale or reddish on drying; inner phyllaries with margin 0.2–0.3 mm wide; outer phyllaries with margin up to 0.1 mm wide; receptacle 2.5–3 mm diam. at maturity, without enlarged attachment points for achenes of female florets. *Florets* 15–30; female florets 4–6; corolla-tube 3.5–5.0 mm long; ligule 1.5–2.5 mm long, usually exceeding phyllaries; corolla of bisexual florets c. 5 mm long. *Achenes* obloid, homomorphic, 2.0–2.5 mm long, with papillose hairs covering c. 50–100% of the otherwise brown or reddish surface, hardly exceeding pappus ring. *Pappus* c. 5 mm long, equally persistent on all achenes.

Flowers mostly winter and spring.

Notes: *Senecio serratifolius* has longer capitula, and the female florets have longer corollas than in *S. glossanthus*, and the achenes differ in being homomorphic. There are two subspecies.

Mid-stem leaves with l:w ratio < 7; margin with several to many serrations; involucre 7–8 mm long **4a.** subsp. *serratifolius*
 Mid-stem leaves with l:w ratio > 7; margin subentire or few-toothed; involucre 6–7 mm long **4b.** subsp. *stenophyllus*

4a. *Senecio serratifolius* I.Thomps. subsp. *serratifolius*

Mid-stem leaves with l:w ratio < 7; margin with several to many serrations. *Involucre* 7–8 mm long. (Figs 1d, 7)

Distribution and Habitat: Occurs in southern South Australia from Fowlers Bay south-east to Kangaroo Island, and in southern Western Australia (Fig. 2c). Grows in sand, on dunes and overlying limestone in coastal vegetation including mallee woodland.

Selected specimens examined: **WESTERN AUSTRALIA:** Bunker Bay, south-west coast, J. Pulley 1468, 18.viii.1973 (CBG). **SOUTH AUSTRALIA:** Yorke Peninsula, Point Davenport, P. Coombe, Aug. 1978 (AD); West Coast, Fowler's Bay, R. Tate, 1877 (AD); North-eastern Eyre Peninsula, Sandhill on Cowell Road, ca. 56 km from Whyalla, J.B. Cleland, 10.ix.1965 (AD); Kangaroo Island, Cape Gantheaume Conservation Park, E of Point Tinline, South Coast, B.M. Overton 1664, 29.ix.1988 (AD); Memory Cove, Cape Catastrophe, E.J. Carroll SA/65 516, 21.ix.1965 (AD, CBG).



Figure 6 *S. halophilus* (holotype: I.R. Thompson 676 MEL).



Figure 7. *S. serratifolia* subsp. *serratifolia* (holotype: J.Z. Weber 6267 AD). Note: The piece in the lower row, second from left is *S. glossanthus*.



Figure 8. *S. serratifolius* subsp. *stenophyllus* (holotype: A.S. George 11435 PERTH).

4b. *Senecio serratiformis* subsp. *stenophyllus* I.Thomps., *subsp. nov.*

A subspecie typica foliis angustioribus dentibus paucioribus, capitulis minoribus differt.

Type: Western Australia, by airstrip, west of homestead, Dirk Hartog Island, A.S. George 11435, 3 Sept. 1972 (PERTH).

Mid-stem leaves with l:w ratio > 7 ; margin sub-entire or few-toothed, *involucre* 6–7 mm long. (Fig. 8)

Distribution and Habitat: Occurs on islands off the west coast of Western Australia (Fig. 2f). Ecological preferences not known.

Selected specimens examined: WESTERN AUSTRALIA: North Is., Houtman Abrolhos, G.M. Storr, 6.ix.1959 (PERTH); West Wallabi Island, Wallabi Islands, Abrolhos, J.J. Alford 641, 5.x.1987 (CANB, PERTH).

5. *Senecio condylus* I.Thomps., *sp. nov.*

A *S. glossaultho* (Sond.) Belcher capitulis majoribus, ligulis multo longioribus, bracteolis et phyllariis pluribus et pigmentosis magis; a *S. pinnatifolio* A.Rich. pilis persistentioribus, acheniis dimorphis differt.

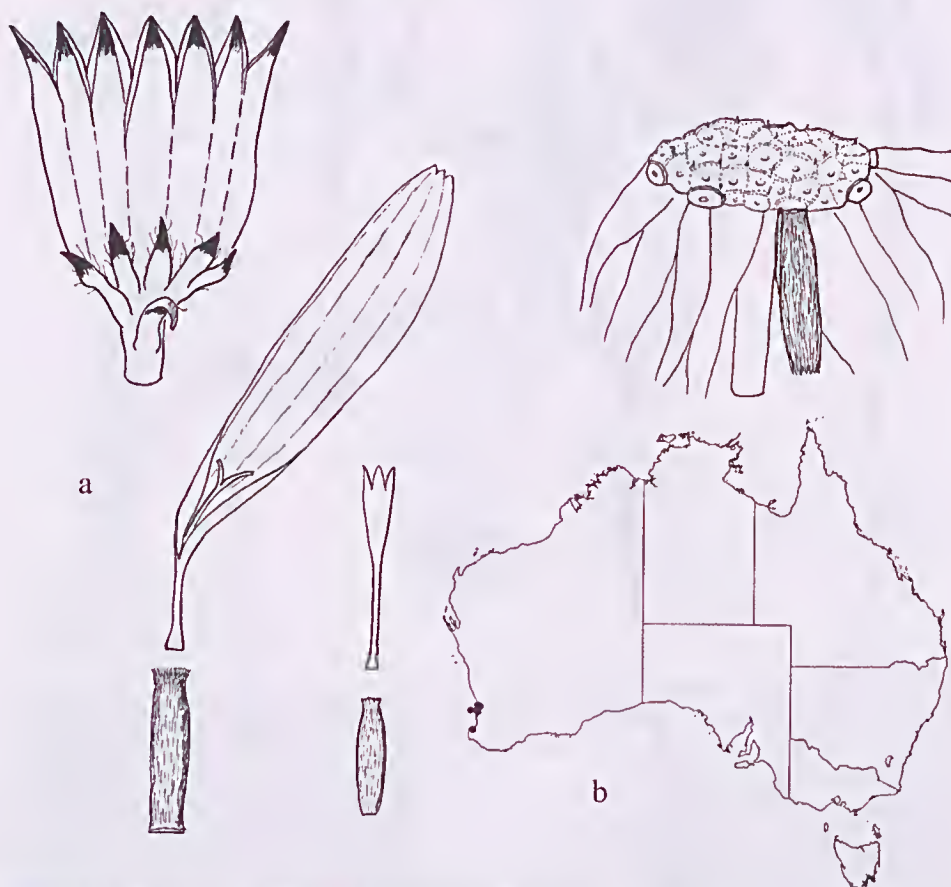


Figure 9. *S. condylus*. a. From l to r: capitulum; female floret; corolla and achene; bisexual floret; corolla and achene; mature receptacle with one achene of female floret attached. 5 times actual size; b. Distribution of *S. condylus*. Note: The record from Coode Is., Melbourne, Victoria is excluded as *S. condylus* is not considered native to Victoria.



Figure 10. *S. condylus* (isotype: L. Haegi 1871 AD; two plants on sheet).

Type: Western Australia, Perth, City Beach, summit of sand dune c. 1 km north of Oceanic Drive, *L. Haegi* 1871, 25 Aug. 1979; holo: PERTH; iso: AD, NSW.

Annual herbs to c. 0.4 m tall, commonly with scattered hairs, mostly glabrescent, but lower surface of leaves commonly with coarse hairs, or their basal portion, tending to persist. Taproot small; secondary roots numerous. *Mid-stem leaves* mostly 3–8 cm long, undivided or lobate to sub-pinnatisect; base cuneate to cordate; margin with scattered or crowded teeth; undivided leaves very narrow-elliptic, very narrow-oblong or oblanceolate; divided leaves with up to 3 segments per side. *Upper-stem leaves* with base commonly cordate, somewhat stem-clasping. *Inflorescences* of few to c. 20 capitula. *Capitulum:* calycular bracteoles 8–12, narrow-ovate to lanceolate, 2.0–3.0 mm long, 0.6–1.2 mm wide, with margin often hairy, with dark purple apical mark 1–1.5 mm long; involucre 4–6 mm long, 3–4 mm diam.; phyllaries mostly c. 13; stereome often suffused with purple below apex, with resin ducts fine, usually pale on drying; inner phyllaries with margin 0.3–0.6 mm wide; outer phyllaries with margin 0.1–0.2 mm wide; receptacle 3.5–5 mm diam. at maturity, with attachment points for achenes of female florets thickened and usually somewhat protruding. *Florets* 50–60; female florets c. 8; corollatube 2–3 mm long; ligule 6–10 mm long; corolla of bisexual florets 5–6 mm long. *Achenes* obloid, dimorphic; achenes of bisexual florets 2–3 mm long, with papillose hairs covering c. 50–90% of the otherwise brown surface, hardly exceeding pappus ring; achenes of female florets 2.8–3.5 mm long, with more robust papillose hairs ± completely covering surface, clearly exceeding pappus ring; carpodium much larger than that of achenes of bisexual florets. *Pappus* 4–5 mm long, absent on mature achenes of female florets. (Figs 9a, 10)

Flowers mostly winter and spring.

Etymology: The epithet alludes to the projections on the receptacle to which the enlarged carpodia of the achenes of female florets are attached (*L. condylus*, projection as in the ball of a ball-and-socket joint).

Distribution and Habitat: Occurs in the Perth and Busselton regions of far south-western Western Australia. (Fig. 9b). It has been collected once from Port Phillip Bay in Melbourne; however, the lack of further collections suggests that the plant was adventive at this location. Grows in sand, often in disturbed sites.

Notes: Consideration was given to the possibility that *S. condylus* was introduced because of its distribution in the city of Perth, but attempts to match it with exotic species were unsuccessful. Furthermore, the dimorphic nature of the achenes and the tuberculate processes on the receptacle margins correspond to the morphology of the indigenous *Glossanthus* group and to some Australian members of the *S. laetus* complex. *Senecio condylus*, although superficially closer to the latter complex because of its larger capitula with large ligules, is closer in other respects to the *S. glossanthus* group.

Selected specimens examined: WESTERN AUSTRALIA: Lake Richmond Nature Reserve, S side, A. Bellman 27A, 4.viii.2000 (PERTH); Port Kennedy bushland, 15 km N of Mandurah, G.J. Keighery & N. Gibson 858, 3.ix.1992 (PERTH); Fremantle, N. Ingleton, Oct. 1947 (PERTH); Busselton, M. Koch, Oct. 1909 (PERTH); Fortview Road, Swanbourne, R.J. Cranfield 382, 24.viii.1978 (MEL, PERTH). VICTORIA: Coode Island, J.R. Tovey & C. French Jr., 1916 (MEL).

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References

- Belcher, R.O. (1956). A revision of the genus *Erechtites* (Compositae) with inquiries into *Senecio* and *Arrhenechthites*. *Annals of the Missouri Botanical Garden* **43**, 1–85.
- Bentham, G. (1867). *Flora Australiensis*, Vol. 3, Lovell Reeve & Co.: London.
- Black, J.M. (1928). Additions to the flora of South Australia. No. 26. *Transactions and Proceedings of the Royal Society of South Australia* **52**, 225–230.
- Lawrence, M.E. (1980). *Senecio* L. (Asteraceae) in Australia: Chromosome numbers and the occurrence of polyploidy. *Australian J. Bot.* **28**, 151–165.
- Thomas, D.C. (2004). Hybridisation between radiate and erechthitoid species of *Senecio* L. on Mount Macedon, Victoria. *The Victorian Naturalist* **121**(1), 23–31.
- Thompson, I.R. (2005b). Taxonomic studies of Australian *Senecio* (Asteraceae). 5. The *S. pinnatifolius*/*S.lautus* complex. *Muelleria* **21**, 23–76.

Index of Scientific Names

Epithets of accepted names are in roman (with bold type for new names) and of synonyms in italics. The numbers (with letters for subspecies) refer to the number of the accepted species as given in the taxonomy section.

Name	No.	Page
<i>Erechtites</i>		
<i>glossantha</i> Sond.	1	6
<i>Senecio</i>		
<i>brachyglossus</i> F.Muell. ex Benth.	1	6
<i>brachyglossus</i> var. <i>brachyglossus</i>	1	6
<i>brachyglossus</i> var. <i>elatio</i> r Benth.	see introduction	3
<i>brachyglossus</i> var. <i>major</i> Benth.	3, 4	13
<i>condylus</i> I.Thomps.	5	18
<i>glossanthus</i> (Sond.) Belcher	1	6
<i>halophilus</i> I.Thomps.	3	13
<i>productus</i> I.Thomps.	2	10
<i>productus</i> subsp. <i>magnus</i> I.Thomps.	2b	10
<i>productus</i> subsp. <i>productus</i>	2a	10
<i>serratifomis</i> I.Thomps.	4	14
<i>serratifomis</i> subsp. <i>serratifomis</i>	4a	14
<i>serratifomis</i> subsp. <i>stenophyllus</i> I.Thomps.	4b	18

Taxonomic studies of Australian *Senecio* (Asteraceae): 5. The *S. pinnatifolius*/*S. lautus* complex

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Abstract

A morphological study of the Australian *Senecio pinnatifolius*/*S. laevis* complex has resulted in a revised classification for this group. Australian plants historically included in *S. laevis* G.Forst. ex Willd. are treated as distinct at the level of species from this and other lautusoid taxa from New Zealand. Seven new species are described, predominantly from arid or semiarid regions. These are: *S. brigalowensis* I.Thomps., *S. depressicola* I.Thomps., *S. eremicola* I.Thomps., *S. hamersleyensis* I.Thomps., *S. lacustrinus* I.Thomps., *S. spannerus* I.Thomps., and *S. warrenensis* I.Thomps. *Senecio spatulatus* A.Rich. is recognised as a species and two new varieties are described: *S. spatulatus* var. *laevis* I.Thomps. and *S. spatulatus* var. *australis* I.Thomps. The name *S. pinnatifolius* A.Rich. is applied to a complex of forms occurring predominantly in mesic regions of Australia, and a new infraspecific classification is presented. *Senecio capillifolius* Hook.f., *S. laevis* subsp. *alpinus* Ali, *S. laevis* subsp. *maritimus* Ali, *S. carnulentus* var. *latilobus* Steetz, and *S. lautus* var. *laueolatus* Benth. are circumscribed and recombined as varieties of *S. pinnatifolius* to become *S. pinnatifolius* var. *capillifolius* (Hook.f.) I.Thomps., *S. pinnatifolius* var. *alpinus* (Ali) I.Thomps., *S. pinnatifolius* var. *maritimus* (Ali) I.Thomps., *S. pinnatifolius* var. *latilobus* (Steetz) I.Thomps., and *S. pinnatifolius* var. *laueolatus* (Benth.) I.Thomps. respectively. *Senecio pinnatifolius* var. *serratus* I.Thomps. and *S. pinnatifolius* var. *leucocarpus* I.Thomps. are described as new. The introduced species *S. madagascariensis* Poir. and the native species *S. condylus* I.Thomps. are similar to the above lautusoid taxa and descriptions of these two species are also presented. Keys to all of the above taxa are presented.

Introduction

The taxonomic history of the Australian lautusoid *Senecio* complex followed the early sequence of events familiar to students of Australian botanical history. Between 1834 and 1845, a dozen new names were applied to members of this complex by various authors, and this burst of activity was followed by a typically more conservative synthesis by Bentham (1867). Bentham assigned most taxa to *Senecio lautus* G.Forst. ex Willd., a species described from a collection from New Zealand. Within *S. lautus* he described one variety endemic to Australia, var. *laueolatus* Benth., based on collections from Victoria with distinctive leaf morphology. Two lautusoid entities segregated from *S. lautus* were *S. spatulatus* A.Rich. and *S. capillifolius* Hook.f. based on the habit and capitulum size in the former, and the leaf morphology of the latter. For nearly a century following Bentham's treatment, there was little taxonomic endeavour pertaining to this complex in Australia.

Ornduff (1960) studied the lautusoid complex with a primary focus on New Zealand forms and decided that Australian forms were endemic to Australia and distinct at a level of species from New Zealand forms. Criteria for this determination were not elaborated on. Ali (1964) agreed that Australian forms were endemic but considered that they should be treated as being distinct at the level of subspecies. He indicated that leaf shape, dimensions of the corolla (ligules relatively short in New Zealand forms) and different breeding systems could separate the New Zealand subspecies from the Australian subspecies he was later to describe. Ali produced the first major work on the Australian complex; he examined the biology, genetics and ecology of the group as well as morphology. In his final paper on the complex (Ali 1969), he described four Australian

subspecies of *S. lautus*. This classification was based on differences in leaf morphology and, to a lesser extent, on plant size. Unfortunately, his key, descriptions and supplementary information lacked detail. The fact that he characterised a large percentage of specimens that could not be placed in his subspecies as 'aff.' entities, indicated that satisfactory taxonomic resolution of the complex was not accomplished.

In the early 1980s, the existence and seemingly rapid expansion of an introduced species, *S. madagascariensis* Poir., in eastern Australia was recognised. Prior to this, specimens of this species had been assigned to *S. lautus*. In the past few years, studies by Scott *et al.* (1998) and Radford *et al.* (2000) have indicated that the form of *S. madagascariensis* established in Australia corresponds to plants native to South Africa rather than Madagascar. Complicating matters, however, is the view of some authors that *S. madagascariensis* and *S. inaequidens* DC. in South Africa are difficult to distinguish, and that these and other species from Africa are best considered as part of an *S. inaequidens* complex until satisfactory taxonomic resolution can be achieved.

Michael (1992) indicated his general dissatisfaction with Ali's classification and briefly gave his impressions of the nature of the diversity of this complex in Australia. Notably, the subsumation of *S. spathulatus* under *S. lautus* subsp. *maritimus* was disapproved of by Michael.

Soon after, Belcher (1993) resurrected the idea that Australian lautusoid forms were distinct at species level, and provided morphological evidence to support this. Belcher described differences in the positioning, shape, and pigmentation pattern of the calycular bracteoles and the lack of sclerenchymal thickening in the stereome of the phyllaries in *S. lautus* s. str. from New Zealand. Belcher rather cryptically contrasted only some of the Australian forms (of unspecified provenance) in these respects with *S. lautus* s. str. before stating that other Australian forms (also of unspecified provenance) have calycular bracteoles not assignable to either type. Finally, in this paper, Belcher nominated *Senecio pinuatifolius* A.Rich. as the best available name for the Australian forms.

A recent study by Radford *et al.* (2004) has shed some further light on the Australian lautusoid complex. In this study, which did not present any taxonomic changes, the number of phyllaries per capitula was suggested as a useful character to discriminate forms from the Brigalow region in southern Queensland and forms from central Australia from other Australian forms. Although a detailed analysis of leaf morphology did not lead to any discrete groupings, leaf length, width, shape, degree of lobation and toothing, and succulence were used in a key to putative variants presented by Radford. An examination of achenial morphology in Australian lautusoids produced some trends but no characters that were found to discriminate variants. Isozyme analysis did not produce well-defined groups and there was some conflict with the pattern produced by morphological data.

In the following purely morphological study, herbarium material from all state herbaria was examined and a range of new characters assessed for taxonomic usefulness. The segregation of Australian forms from New Zealand forms is supported on the basis of a combination of characters, all of which were alluded to by either Ali or Belcher as summarised above.

Materials and Methods

Herbarium specimens from AD, BRI, CANB, DNA, HO, MEL, NE, NSW, and PERTH were examined. Field observations and collections made in Victoria and south-eastern New South Wales supplemented the herbarium data. The circumscriptions of, and morphological variation within, previously recognised taxa was critically assessed and new taxonomic concepts developed and tested. Both the more detailed examination of previously utilised characters and the adoption of novel characters contributed to the development of a revised classification. Distribution maps were generated using the ArcView computer program.

Results

Several new non-foliar taxonomic characters have provided a basis for a new classification of the Australian *lautosoid* complex. These include size of taproot, phyllary and calycular bracteole morphology including width of the stereome and hyaline margin portions and pigmentation pattern (Fig. 2), the number of phyllaries per capitulum, the ratio of ray floret number to phyllary number, the size of and dimorphism in the achenes, and details of the indumentum of the achenes.

Leaf morphology (Fig. 1). The bewildering variation in leaf morphology in the Australian *lautosoid* complex has been a stumbling block to developing a satisfactory classification for this group. The key to subspecies that Ali presented was based largely on the presentation of leaf silhouettes, with categories named as alpha, beta and gamma types. Although the current study has shown that there is some merit in his groups, there is significant scope for misinterpretation of his key, and the absence of descriptions of the subspecies compounds the problem. It is important to understand that, in all or most Australian *lautosoids*, the occurrence and degree of leaf division is highly plastic. Individuals, let alone populations, can sometimes contain a mixture of undivided and divided leaves (Fig. 1c). Leaf size and shape also fluctuates greatly within populations according to environmental conditions and whether the leaf is of a stem, branch or secondary branch. It is important that comparisons are always made between leaves occurring in the same region of the plant. Nevertheless, in this study the following leaf characters have been recognised as taxonomically useful and they make a modest contribution to the identification of taxa in the new classification.

The average position of leaf segments along the leaf (distal, central or proximal) and to a lesser extent the total number of marginal points (including callus points, denticulations, teeth, lobes, and pinnate segments) developed along a leaf are reasonably consistent within most taxa. For instance, the gamma-type leaf morphology that Ali recognised for *S. lautus* subsp. *alpinus* demonstrates an average position of marginal points that is slightly distal to mid-leaf and has several to numerous marginal points (Fig. 1b); his beta-type morphology corresponding to *S. lautus* subsp. *dissectifolius* demonstrates an average position of segments as proximal to mid leaf and has few marginal points (Fig. 1a). The shape of the rachis (see glossary below) changes from oblanceolate through elliptic to lanceolate from the base to the summit of stems or branches. However, the extent to which this progression occurs is variable between taxa (examples of upper-branch leaves in Fig. 1d).

Leaf succulence and fleshiness can be useful taxonomically, although succulence in particular can vary within populations according to environmental conditions, e.g. proximity to the coast.

Geography. A significant finding in this study of the *S. pinnatifolius*/*S. lautus* complex has been the predominantly allopatric distributions of the native taxa. In most instances two or more taxa are not likely to be found growing together, or if so only in relatively narrow zones at the interfaces of their distributions. However, *S. spathulatus* is likely to be sympatric with varieties of *S. pinnatifolius* along the coast, and *S. spanomerus* I.Thomps. with *S. pinnatifolius* var. *uaritinnus* (Ali) I.Thomps., also along the coast. The distribution of the introduced *S. madagascariensis* appears to broadly overlap the distribution of *S. pinnatifolius* var. *pinnatifolius* and possibly that of *S. pinnatifolius* var. *serratus*; however, there are no records indicating whether the native and introduced species are closely intermingled at particular sites.

Terminology

Chevron (Fig. 2a): A chevron is an upside-down V of purple pigmentation delineating the apex of the stereome of inner phyllaries. It is a feature of *S. pinnatifolius* var.



Figure 1. Leaf morphology: a. Leaves with marginal points absent or few (lower branch leaf and a mid-branch leaf from a single plant of *S. spanowerus*); b. Leaves with numerous marginal points and their average position distal to mid-leaf (*S. pinnatifolius* var. *alpinus*, mid-stem leaves from two different plants); c. Within-population variation in number of marginal points and degree of dissection (mid-stem leaves of *S. pinnatifolius* var. *lanceolatus*; from Western Port Bay, Victoria); d. Variation in shape in upper-branch region (from l to r): *S. spanowerus* (n.b. average position of segments is proximal to mid-leaf), *S. pinnatifolius* var. *lanceolatus*, *S. pinnatifolius* var. *pinnatifolius* (from east coast of New South Wales), *S. pinnatifolius* var. *maritimus*. Magnification: a–c times 0.7; d times 1.2.

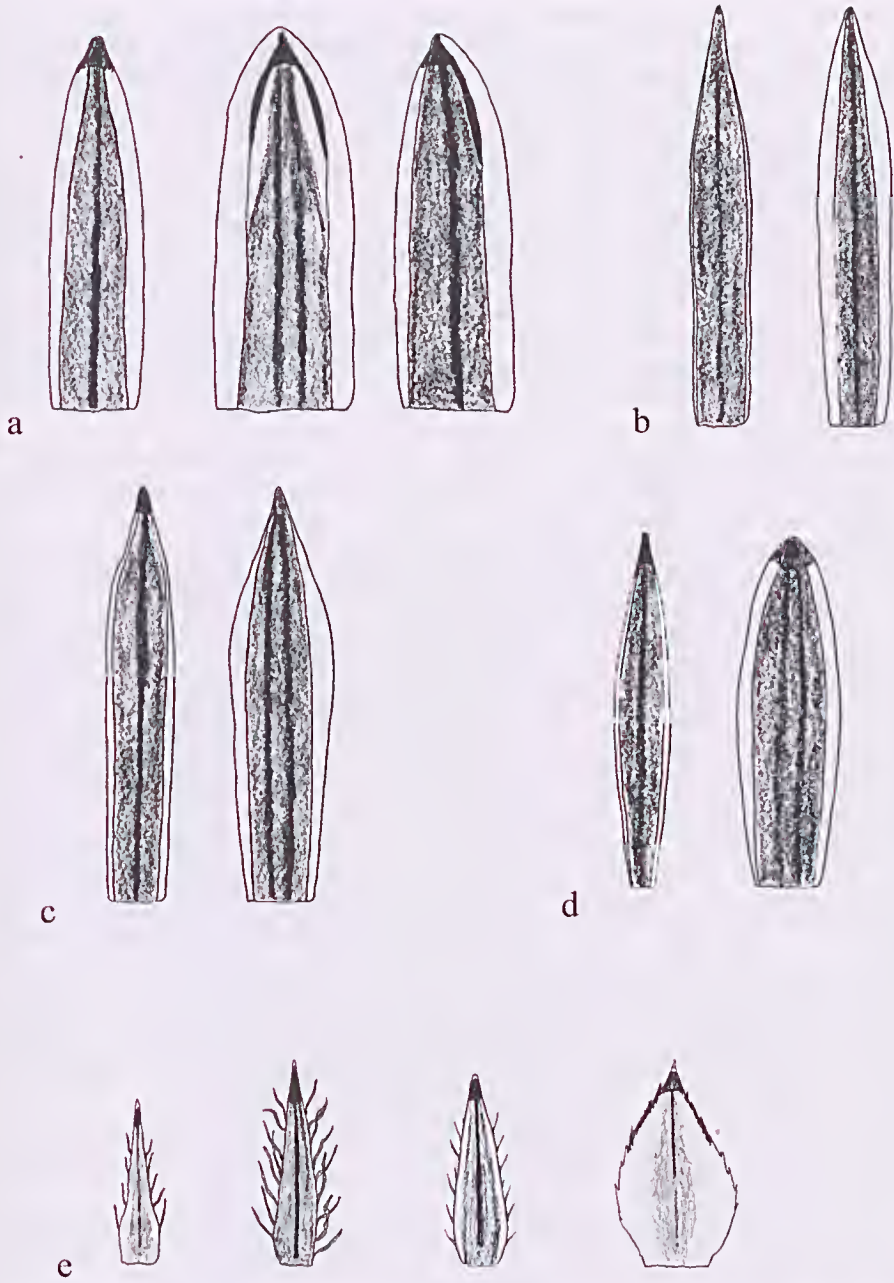


Figure 2. Phyllary and bracteole morphology: a–d. Examples of phyllaries (from l to r): outer, inner and, in a, intermediate. a. *S. pinuatifolius* var. *lanceolatus* (note full chevron on inner phyllary and half chevron on intermediate phyllary); b. *S. ereuicola*; c. *S. pinuatifolius* var. *pinuatifolius*; d. *S. spanomerus*. e. Examples of calycular bracteoles (from l to r): *S. brigalowensis*, *S. spanomerus*, *S. pinuatifolius* var. *pinuatifolius*, *S. pinuatifolius* var. *latilobus*. Magnification: All times 10.

lauceolatus and, to a lesser extent, *S. pinnatifolius* var. *latilobus*. The two arms of the chevron extend 0.5–1.5 mm down the margin from the apex of the stereome. In *S. pinnatifolius* var. *lauceolatus* the chevron may be just visible with the naked eye, and it delineates a stereome that is relatively broad distally. In *S. pinnatifolius* var. *latilobus* the chevron is finer and magnification is likely to be required to detect it.

Dimorphic achenes: A syndrome present in some lautusoid species and in species allied to *S. glossaulius* (Thompson 2005) where the achenes of ray florets are plumper and often longer, have an indumentum of more robust, longer papillose hairs, and have a broader carpopodium, and where the carpopodium fits over an enlarged and/or thickened and variably projecting attachment point on the perimeter of the receptacle (reminiscent of a ball-and-socket joint). Furthermore, these achenes are typically reddish or orangish in contrast to brown or olive-green achenes of the disc; in taxa with homomorphic achenes this colour distinction is absent or less pronounced. The achenes of the ray florets also have a tendency to remain attached for longer than the achenes of the disc and may persist until the phyllaries become reflexed.

Divided (of leaves): When the sinuses extend more than halfway towards the midrib.

Homomorphic (of achenes): Where all achenes of a capitulum are similar in shape and indumentum (cf. dimorphic)

Hyaline margin of phyllaries and bracteoles (Fig. 2): The more or less transparent rim of tissue surrounding the herbaceous centre (stereome) of phyllaries and calycular bracteoles. This margin is more sharply defined in phyllaries. The width, see under phyllaries, is fairly consistent within, and has some value in discriminating between, taxa. In some taxa, e.g. *S. pinnatifolius* var. *maritimus* the margin narrows relatively abruptly in the distal third, whereas in many other taxa the narrowing is slight and gradual throughout.

Marginal points: Points occurring along the margin of leaves including callus points, denticulations, teeth, lobes and segments. If points are lacking, the margin is entire.

Pappus-ring: The rim of pale tissue at the summit of an achene to which pappus bristles attach. This rim is sometimes exceeded by the papillose hairs.

Phyllaries: inner, outer and intermediate (Fig. 2): This definition applies to the taxa treated in this paper but is largely applicable to many Senecionoid genera. The involucre of *Senecio* is uniseriate but there is a pattern of overlapping of the margins, with outer phyllaries overlapping the adjacent inner phyllaries to the outside. The margin of outer phyllaries is narrower and is sometimes vestigial. Similarly, the stereome q.v. of outer phyllaries is generally also broader than that of inner phyllaries, although occasionally an inner phyllary has a very narrow stereome. The regular alternation of outer and inner phyllaries is frequently upset by the presence of interspersed intermediate phyllaries. These are morphological chimeras of an outer and inner phyllary. One or more of these phyllaries are likely to be present in any one involucre (Fig. 2a).

Rachis of leaves: The central zone of uninterrupted lamina, i.e. lamina that is not broken into by sinuses of teeth, lobes etc. The rachis (at its widest) in Fig. 1a is c. 1.3 mm, and in Fig. 1b (left) it is c. 8 mm.

Stereome (Fig. 2): The herbaceous portion of a phyllary. Embedded in the stereome are one or two longitudinal resin ducts of variable prominence extending from base to apex, and surrounding the stereome is a hyaline margin.

Unit inflorescence: Defined in this paper as a group of capitula terminating a stem or branch where all their supporting primary branchlets are leafless.

Key to species

This key is based predominantly on pressed herbarium material. Capitular characters will commonly require magnification. The involucre diameter given is for unpressed specimens and is measured mid-involucre. Pressing increases the diameter/width by up to 50%. Leaves refers to those leaves in the middle third of stems or major branches (leaves of short inflorescence branches and uppermost leaves of branches will be considerably smaller).

- 1 All or most capitula in an inflorescence with phyllaries c. 13 or c. 20 and number of ligules several fewer than number of phyllaries, i.e. ligules 8–10, phyllaries 13; ligules c. 13, phyllaries c. 20 (arid, semiarid or mesic environments)
- 2 Stem and major branch leaves commonly undivided, sometimes with a few lobes per side; leaf margin with frequent often minute marginal points per side (often difficult to ascertain in pressed material); phyllaries mostly c. 20; achenes 1.5–2.2 mm long, 0.3–0.5 mm diam 1. *S. madagascariensis*
- 2: Stem and major branch leaves divided or not; leaf margin with few to numerous marginal points per side, but if numerous then leaves generally markedly serrate, lobate or pinnatisect; phyllaries mostly c. 13 or mostly c. 20; achenes (1.8–)2.0–5.0 mm long, 0.5–0.8 mm diam.
- 3 Lower surface of leaves often with numerous somewhat persistent coarse hairs or hair-bases; calycular bracteoles with intense purple pigmentation in distal half to one third; achenes of ray florets c. 1 mm longer than those of disc florets and with a much broader carpopodial ring (Perth region and Busselton, Western Australia) 11. *S. coudylus*
- 3: Lower surface of leaves commonly glabrous or nearly so, sometimes occasional long hairs persistent; calycular bracteoles with pigmentation usually not as intense and/or extensive as above; ray achenes not dimorphic as above or if ever approaching this degree of dimorphism, then only the distal quarter or less of calycular bracteoles pigmented (widespread)
- 4 Phyllaries > 5.0 mm long and mature achenes of ray florets > 3.0 mm long; achenes of ray florets slightly longer than those of disc florets; attachment zones on receptacle for achenes of female florets more prominent than those for achenes of disc florets
- 5 Phyllaries mostly c. 20; ligules mostly c. 13 (central Australia between latitudes 22° and 27°) 8. *S. ereunicola*
- 5: Phyllaries mostly c. 13; ligules mostly c. 8; (arid southern Australia south of latitude 26°) 9. *S. lacustrinus*
- 4: Phyllaries < 5.0 mm long and/or mature ray achenes < 3.0 mm long, or if phyllaries and achenes slightly longer then achenes or receptacle not as above
- 6 Annuals, not developing bark on lower stems and taproot; leaves pressing thin; margin of mid-stem leaves with several to numerous denticulations/ teeth per side; in dried specimens paler involucre commonly contrasting with a brown to dark-brown receptacle (in some or most capitula) (southern Queensland and adjacent eastern parts of Northern Territory and South Australia)
- 7 Phyllaries mostly 13 (and ligules c. 8), occasionally phyllaries mostly c. 18; achenes 1.6–2.5 mm long; achenes of female florets with surface fully obscured by coarse papillose hairs, with these hairs strongly overtopping pappus-ring (Lake Eyre basin, far south-western Queensland, north-eastern South Australia, also eastern Northern Territory) 7. *S. depressicola*
- 7: Phyllaries mostly c. 18–22 (and ligules c. 13); achenes 2.5–3.0 mm long; achenes of female florets with surface partly obscured by fine hairs, with these hairs hardly overtopping pappus-ring (semiarid to arid south-eastern to south-central Queensland) 6. *S. brigalowensis*
- 6: Perennials (commonly), with bark developing on lower stems and major branches and taproot; leaves pressing thin or somewhat fleshy; margin of stem/major branch leaves lacking or with 1 or 2 denticulations/teeth per side, occasionally with several; in dried specimens involucre and receptacles not contrasting as above or if so marginal points on mid-stem (mid-branch) leaves few per side (north-western and south-eastern Australia)

- 8 Leaves not fleshy, pressing thin, above mid-branch tapering to subpetiolate basally; margin of leaves entire (Hamersley Range and environs and Cape Range, Western Australia)...10. *S. hamersleyensis*
- 8: Leaves often slightly fleshy, pressing thin or thick, above mid-branch often very narrow but generally not tapering basally; margin of leaves entire or with denticulations (southern and eastern Australia)
 - 9 Mid-branch leaves 2–3-pinnatisect 4. *S. pinnatifolius*
 - 9: Mid-branch leaves 1-pinnatisect
 - 10 Segments of leaves $\pm$ filamentous (< 0.8 mm wide dried; l:w ratio > 15); calycular bracteoles 1–3 mm long, purple or black-tipped, mostly without coarse white hairs; achenes glabrous or variously hairy (dry hills, often rocky) 4. *S. pinnatifolius*
 - 10: Segments of leaves mostly narrow-oblong to narrow-linear (mostly > 0.8 mm wide dried; l:w ratio < 15); calycular bracteoles 1.8–3.5 mm long, generally black or brown-tipped, often with coarse white hairs; achenes $\pm$ densely hairy (semi-arid plains) 5. *S. spauomerus*
- 1: All or most capitula in an inflorescence with number of phyllaries c. 13, and number of ligules similar (semiarid or mesic environments)
 - 11 Leaves very fleshy, to 5 cm long; involucre 5–11 mm long; broader stercomes to 3.0 mm wide, not ridged on drying; achenes 3.0–7.0 mm long; pappus usually persistent (coastal or near coastal dunes)
 - 12 Undivided leaves with l:w ratio < 4 (rachis of divided leaves with l:w ratio < 15); margin of leaves usually serrate or serrulate; calycular bracteoles not or hardly overlapping at anthesis; achenes glabrous or variously hairy (eastern Australia) 2. *S. spathulatus*
 - 12: Undivided leaves with l:w ratio > 4 (rachis of divided leaves with l:w ratio > 15); margin of leaves entire or nearly so; calycular bracteoles overlapping at anthesis; achenes densely hairy (south-western Western Australia) 3. *S. warreueensis*
 - 11: Leaves thin to fleshy, to 15 cm long; involucre 3–8 mm long; broader stereomes to 1.5 mm wide, commonly ridged on drying; achenes 1.6–4.5 mm long; pappus mostly caducous (habitat various)
 - 13 Plants $\pm$ erect, developing a stout taproot; mid-branch leaves with l:w ratio of rachis mostly > 10 , $\pm$ lacking marginal points except for 0–2(–3) entire segments per side, not developing straplike basal segments from an undilated rachis; segments $\pm$ linear but not filamentous (rachis mostly > 0.8 mm wide; l:w ratio < 15 when dried); outer phyllaries with hyaline margin very narrow (to c. 0.1 mm wide); calycular bracteoles narrow-ovate to lanceolate, usually $\pm$ all herbaceous and distinctly black- or brown-tipped; achenes to 2.8 mm long, less than half length of phyllaries; $\pm$ densely papillose-hairy with hairs of achenes of ray florets exceeding pappus-ring (predominantly semiarid lowland environments of southern Australia) 5. *S. spauomerus*
 - 13: Plants not entirely as above (widespread but generally not as above) 4. *S. pinnatifolius*

Taxonomy

1. *Senecio madagascariensis* Poir., *Encycl.*, suppl. 5: 130 (1817)

Type: Madagascar, Commerson ['Cette plante a été recueillie par Commerson à l'Île de Madagascar'], Herb. Desf. T: ?P n.v.

Perennial to 0.6 m tall, erect, $\pm$ glabrous. *Taproot* often inconspicuous. *Leaves* in mid-region of stems or major branches mostly 3–10 cm long, with marginal points 15–25 per

side, mostly undivided, not fleshy, thin on pressing; base attenuate; margin denticulate or callus-denticulate; undivided leaves very narrow-elliptic to linear; divided leaves with 1 or 2 narrow-triangular lobes per side, average position $\pm$ central. *Uppermost leaves* base sometimes slightly dilated, with auricles denticulate. *Inflorescences* of 2–20 capitula. *Capitula*: calycular bracteoles 8–12, narrow-ovate to lanceolate, 1.5–2.0 mm long, 0.5–0.8 mm wide, with stereome sometimes suffused purple, with margin $\pm$ glabrous; apex acute to peracute, pigmented purple or black in zone c. 0.5 mm long; involucre 4.0–6.0 mm long, c. 3–5 mm diam.; phyllaries c. 20 (for all or most capitula); apex brown or black; stereome somewhat fleshy, often suffused with purple below apex; resin ducts distinct, pale or orange on drying; inner phyllaries: broader stereomes 0.5–0.8 mm wide; margin 0.2–0.3 mm wide; outer phyllaries: margins vestigial to c. 0.1 mm wide proximally. *Florets* 50–70; ligulate florets c. 13, with ligule 5–10 mm long; corolla of disc florets 3–5.5 mm long. *Achenes* homomorphic, c. 40% of length of phyllaries, 1.5–2.2 mm long, 0.3–0.5 mm diam., mid to dark brown, with ribs flat; papillose hairs in bands covering c. 20–50% of surface, mostly appressed, with l:w ratio c. 2–3; hairs of achenes of ray florets not exceeding pappus-ring. *Pappus* 3–5 mm long, caducous. (Fig. 4)

Flowers most of the year.

Distribution and Habitat: Occurs in far eastern Australia, from south-eastern Queensland south to far south-eastern New South Wales. Also recorded a few times from Melbourne and the Mornington Peninsula in south-central Victoria but not naturalised (Fig. 3a). Grows in various soils usually in disturbed sites particularly roadsides and cleared land.

Notes: A native of South Africa and Madagascar. Probably naturalised in Australia for some time before it was recognised as an introduced species in the 1980s. *Senecio madagascariensis* can be distinguished from *S. pinnatifolius*, *S. brigalowensis* and other similar laetusoid species by a combination of characters: more numerous phyllaries, thinner leaves that are mostly undivided but with numerous marginal points (mostly as tiny denticulations), and shorter and more slender achenes with smaller papillose hairs. The achenes also tend to be more tapered basally and sometimes more so apically. The stereome of phyllaries and bracteoles are sometimes suffused purple and this character has not been observed in the native laetusoid species in Australia.

Selected specimens examined: QUEENSLAND: 1 km N of Mt Maroon, P.I. Forster PIF6841, L.H. Bird & A.R. Bean, 26.v.1990 (BRI, MEL); Tomewin, C.E. Woolcock & D.T. Woolcock, 10.vii.1985 (MEL). NEW SOUTH WALES: 'Cooplacurripa', Wingham–Nowendoc Road, R. Holtkamp 21, 19.vi.1996 (CANB, MEL, NE); Port Macquarie, L. Pedley 5543, 25.vii.1990 (AD, BRI, DNA, MEL, NSW, PERTH); alongside Karuah State Forest, south of Stroud, J.R. Hosking 1279, 29.viii.1996 (CANB, MEL, NE, NSW). VICTORIA: Balmarring, on road verge of Hastings–Flinders Road, R.J. Adair s.n., 14.vii.1991 (MEL).

2. *Senecio spathulatus* A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 125 (1834)

Type: Tasmania, D'Entrecasteaux Channel ['Creseit in Nova-Hollandia loco vulgo dicto Detroit d'Entrecasteaux'], A. Lesson; *holo*: P n.v.

Perennial to 0.5 m tall, sprawling to prostrate, $\pm$ glabrous. *Primary roots* not seen; developing roots from prostrate stems. *Leaves* in mid-region of stems or major branches 1–5 cm long, with marginal points 0–15 per side, mostly undivided, very fleshy, drying thick and wrinkled; base cuneate to truncate; margin dentate, serrate or denticulate; undivided leaves obovate or oblanceolate; divided leaves with 1–3 narrow-oblong segments per side, average position more or less central. *Uppermost leaves* sometimes oblong or elliptic; base sometimes becoming weakly clasping. *Inflorescences* of 1–5 capitula. *Capitula*: calycular bracteoles 8–12, imbricate at anthesis or not, ovate to narrow-ovate, 1.5–3.0 mm long, 1.0–1.5 mm wide; with margin bearing weak hairs; apex subacute to acute, pigmented purple in zone c. 0.5 mm long; involucre 5.0–11.0 mm long,



Figure 3. Distribution of a. *S. uadagascariensis*; b. *S. spathulatus* var. *spathulatus*; c. *S. spathulatus* var. *latifructus*; d. *S. spathulatus* var. *attenuatus*; e. *S. warrenensis*.



Figure 4. *S. madagascariensis* (P.I. Forster PIF28891 MEL).

3–10 mm diam.; phyllaries c. 13, rarely a minority of capitula with 8–10, with apex pigmented black or purple or unpigmented; stercome fleshy, commonly drying dark brown; resin ducts obscure; inner phyllaries: broader stercomes 1.0–3.0 mm wide; margin 0.3–0.4 mm wide broadening to 0.8–1.2 mm wide in proximal two-thirds; outer phyllaries: margin 0.1–0.3 mm wide, broadening to 0.3–0.8 mm wide in proximal two-thirds. *Florets* 60–140; ligulate florets c. 13, with ligule 10–25 mm long; corolla of disc florets 5–8 mm long. *Achenes* $\pm$ homomorphic, 50–60% of length of phyllaries, 3.0–7.0 mm long, 0.5–1.2 mm diam., orange, golden, light brown, or straw coloured, with ribs often convex; papillose-hairs sparse to dense in bands or covering entire surface, $\pm$ appressed, with l:w ratio c. 3–5, or achenes glabrous; hairs of achenes of ray florets not exceeding pappus-ring. *Pappus* 5–7 mm long, persistent.

Flowers most of the year.

Notes: *Senecio spathulatus* is a specialised coastal species occurring mostly on frontal dunes and forming low, broad clumps. It is characterised by short fleshy leaves, large fleshy capitula, and large fruit with a persistent pappus. There are three varieties.

- 1 Mid-branch leaves usually tapering somewhat basally (width 3 mm from base commonly $< 1/3$ of the maximum width); achenes $\pm$ densely hairy (central coast of New South Wales).....2c. var. *attenuatus*
- 1: Mid-branch leaves not tapering or tapering slightly basally (width 3 mm from base commonly $> 1/3$ of the maximum width); achenes glabrous or sparsely to moderately hairy (distribution further south than above)
 - 2 Achenes 4.0–7.0 mm long, c. 0.8–1.2 mm diam., straw coloured to pale brown, glabrous, rarely with scattered hairs (eastern Victoria, far south-eastern New South Wales).....2b. var. *latifructus*
 - 2: Achenes 3.0–5.5 mm long, c. 0.5–0.8 mm diam., sparsely to moderately hairy or glabrous, surface golden or dark brown (Tasmania).....2a. var. *spathulatus*

2a. *Senecio spathulatus* A.Rich. var. *spathulatus*

Leaves in mid-region of major branches tapering slightly basally. *Capitula*: involucre 5.0–9.0 mm long, 3–7 mm diam.; broadest stercome 1.2–2.0 mm wide. *Achenes* 3.0–5.5 mm long, c. 0.5–0.8 mm diam., orange-brown or mid-brown, with ribs narrow, prominent; papillose hairs absent or sparse to dense in narrow bands. *Pappus* longer than the achene, with bristles not fused basally.

Distribution and Habitat: Occurs on the southern and western coasts of Tasmania, and on King Island in Bass Strait (Fig. 3b).

Notes: This variety of *S. spathulatus* is sympatric and possibly hybridises with *S. pinnatifolius* var. *maritimus* on the southern and western coastlines of Tasmania and on King Island. Leaves of these taxa are similar in size; however, *S. spathulatus* var. *spathulatus* typically has serrulate leaves that dry yellow, whereas *S. pinnatifolius* var. *maritimus* has entire leaves or leaves with few teeth that dry dark olive-green. The capitula of *S. spathulatus* var. *spathulatus* are larger and the achenes longer and with a persistent pappus. Further field work is desirable to better understand the relationship between these two taxa.

Selected specimens examined: **TASMANIA:** Stanley Beach, J. Somerville, 1.v.1949 (HO); Ocean Beach, Strahan, H.N. Barber, July 1955 (HO); Mt Cameron West, T.E. Burns 348, 5.iii.1960 (HO); Prion Beach, A.M. Buchanan 3467, 26.iv.1984 (HO); Mulcahy Bay, A.M. Buchanan 8026, 19.i.1986 (HO); Surprise Bay, A. Moscal 901, 25.i.1982 (HO); Ocean Beach, A.M. Buchanan 15370, 24.xi.1998 (HO); Henty Dunes, c. 15 km north of Strahan, P.C. Heyligers 93004, 2.ii.1993 (CANB); Christmas Island, King Island, N.P. Brothers, 20.xi.1987 (HO); Near Marrawah, Tasmania, toward Green Point, E.M. Canning 1843, 26.i.1969 (CANB, NSW).

2b. *Senecio spathulatus* var. *latifructus* I.Thomps., var. nov.

A varietate typica capitulis majoribus, acheniis majoribus pallidus differt.

Type: Victoria, Lakes Entrance, at westerly exit to beach from Lions Park at the end of East Beach Road, *P.C. Heyligers* 84004, 27 Mar. 1984; holo: MEL; iso: CANB.

Leaves in mid-region of major branches not tapering or tapering only slightly basally. *Capitula:* involucre 7.0–11.0 mm long, 5–10 mm diam.; broadest stereomes 2.0–3.0 mm wide. *Achenes* 4.0–7.0 mm long, c. 0.8–1.2 mm diam., pale brown or straw coloured, with ribs sometimes indistinct; papillose hairs absent or rarely scattered in narrow bands. *Pappus* sometimes shorter than the achene, particularly for marginal achenes, with bristles sometimes fused basally (Fig. 5)

Eymology: The epithet refers to the broad fruit of this variety (*L. latus*, broad, and *fructus*, fruit).

Distribution and Habitat: Occurs on the Victorian coast east from Wilsons Promontory and in adjacent areas of far south-eastern New South Wales (Fig. 3c).

Notes: This variety has the largest capitula and achenes of the three varieties. Although mostly with glabrous, sometimes unribbed achenes, occasional specimens have pale yellow achenes with scattered hairs.

Selected specimens examined: NEW SOUTH WALES: Nadgee Nature Reserve, Cape Howe, *J. Miles s.n.*, 12.xi.2002 (MEL). VICTORIA: Lake Tyers, ± 6 km ENE of PO, on frontal dunes on Ninety Mile Beach, *R.J. Adair* 2240, 1.v.1987 (AD, CANB, MEL); Mt Singapore, [Wilson's Promontory] National Park, *J.A. Leach*, May 1910 (MEL); Tamboon Inlet, near Cann River, *M. Walton*, 29.xi.1956 (MEL); Captain Cook National Park, W of Cape Everard Lighthouse, *A.C. Beaglehole* 34488, 10.xi.1970 (MEL); Ewing Marsh Wildlife Reserve, ± 10 km SW of Orbost P.O., *A.C. Beaglehole* 68188, 5.ii.1980 (MEL).

2e. *Senecio spathulatus* var. *attenuatus* I.Thomps., var. nov.

A varietate typica foliis attenuatioribus, indumento acheniorum densiore differt.

Type: New South Wales, Cronulla Recreation Reserve, *P.C. Heyligers* 88108, 8 July 1988; holo: CANB.

?*Senecio anacampteros* DC., *Prodr.* 6: 374 (1838). *Type:* New South Wales, Port Jackson, [Sydney], *Fraser*; holo: G u.v. (photo seen CANB). [Possible synonymy based on appearance of photograph of type, but protologue is at odds with circumscription below.]

Leaves in mid-region of major branches usually tapering moderately basally. *Capitula:* involucre 6.0–10.0 mm long, 4.5–7 mm diam.; broadest stereomes 1.5–2.2 mm wide. *Achenes* 4.0–6.0 mm long, c. 0.5–0.7 mm diam., moderately narrowed at each end, light brown, with ribs obscured; papillose hairs in broad bands covering all or most of surface. *Pappus* longer than the achene, with bristles not fused basally.

Eymology: The epithet refers to the more pronounced tapering of the leaves towards the base in this variety (*L. attenuatus*, attenuate).

Distribution and Habitat: Occurs on the east coast of New South Wales from Forster south to Jervis Bay (Fig. 3d).

Notes: This variety can be distinguished from coastal forms of *S. pinnatifolius* var. *pinnatifolius* by the fleshier leaves, larger capitula and longer, more densely hairy achenes.

Selected specimens examined: NEW SOUTH WALES: Kurnell, Botany Bay, *J.L. Boorman*, May 1906 (NSW); Mungo Beach, ENE of Mungo Brush, *A.N. Rodd* 3734, 11.ix.1981 (NSW); Wamberal Beach, *E. Cheel*, Apr. 1911 (NSW); Myall Lakes National Park, SE of Bombah Broadwater, Mungo Corner, *W. Greuter*, 2.ix.1988 (NSW); Quibray Bay, Kurnell, *L.A.S. Johnson*, 28.viii.1965 (NSW).

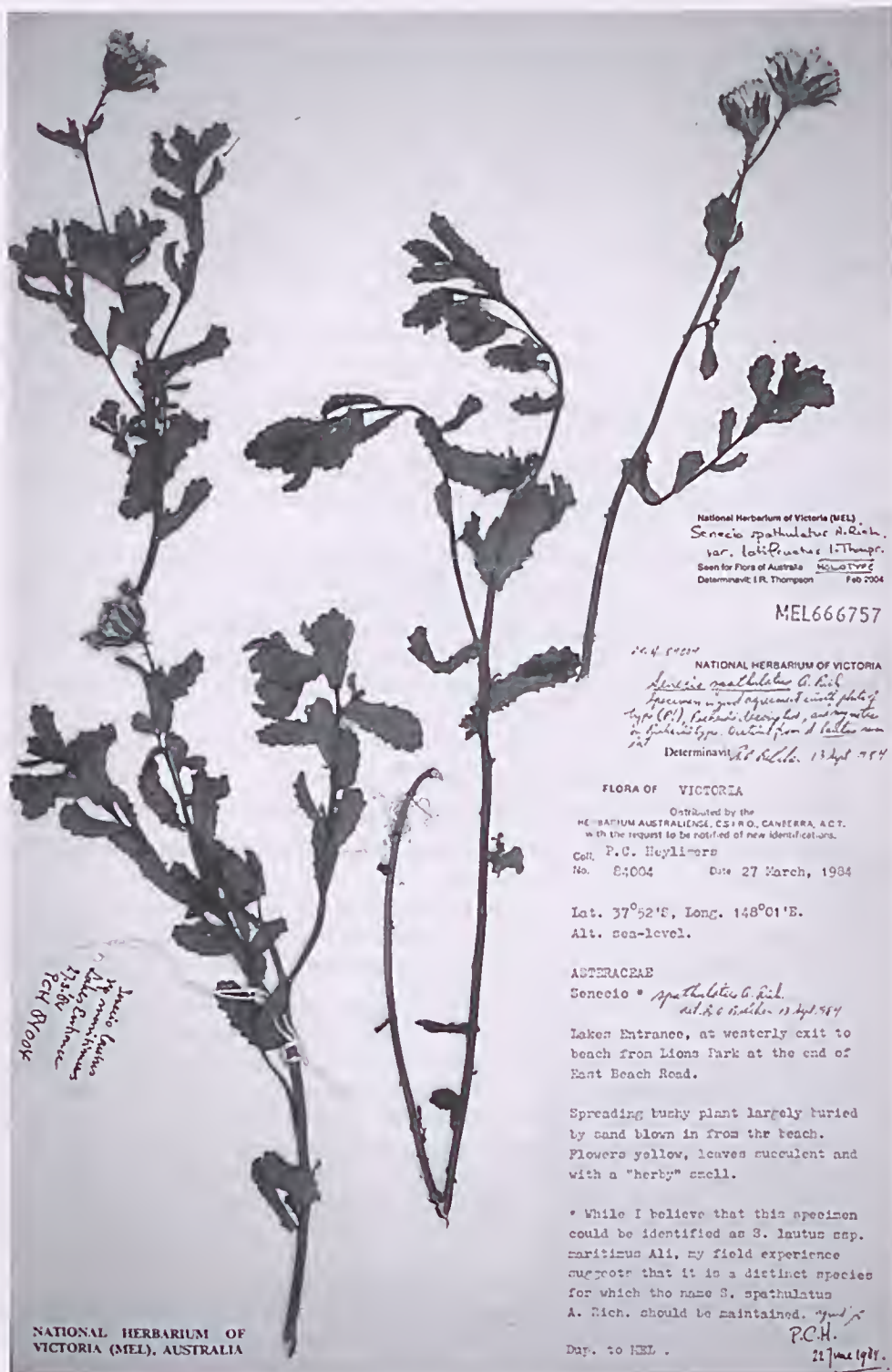


Figure 5. *S. spathulatus* var. *latifructus* (holo: P.C. Heyligers 84004 MEL).



3. *Senecio warrenensis* I.Thomps., *sp. nov.*

A *S. spathulato* A.Rich. foliis angustioribus margine integerrimis, bracteolis latioribus imbricatus differt.

Type: Western Australia, Warren Drift Sands, *P.C. Heyligers* 88139, 12 Sep. 1988; *holo:* CANB.

Perennial to 0.3 m tall, sprawling to prostrate, largely glabrous. *Primary roots* not seen; roots arising from prostrate stems. *Leaves* in mid-region of stems or major branches 2–5 cm long, with marginal points 0–7 per side, divided or not, fleshy, drying thick and wrinkled; base commonly narrow; margin entire or denticulate; undivided leaves very narrow-elliptic or linear; divided leaves with 1–4 oblong to very narrow-oblong segments per side, average position more or less central. *Uppermost leaves* sometimes slightly lanceolate; base sometimes weakly stem-clasping. *Inflorescences* of 1–5 capitula; peduncle moderately hairy when developing, glabrescent. *Capitula:* calycular bracteoles 12–18, imbricate at anthesis, broad-ovate to ovate, 2.5–4.5 mm long, 1.5–2.5 mm wide, with margin $\pm$ glabrous; apex acute, pigmented purple in zone 0.5–1.0 mm long, and commonly extending down margin to form a chevron; involucre 7.0–9.0 mm long, c. 6–8 mm diam.; phyllaries c. 13, with apex pigmented purple; stereome fleshy, commonly drying pale yellow-green; resin ducts obscure; inner phyllaries: broader stereomes 1.3–2.0 mm wide; margin 0.1–0.4 mm wide, broadening to 0.5–1.0 mm wide in proximal two-thirds; outer phyllaries: margins vestigial or to 0.1 mm wide broadening to 0.3–0.5 mm wide in proximal two-thirds. *Florets* c. 80–100; ligulate florets c. 13, with ligule 8–15 mm long; corolla of disc florets 6–8 mm long. *Achenes* $\pm$ homomorphic, c. 50% of length of phyllaries, 4.0–4.5 mm long, light brown, with ribs $\pm$ flat; papillose-hairs moderately dense in bands obscuring most of surface, appressed to divergent, with l:w ratio 4–6; hairs of achenes of ray florets slightly exceeding pappus-ring. *Pappus* 5–8 mm long, possibly somewhat persistent. (Fig. 6)

Flowers recorded in September.

Etymology: The epithet refers to the type locality near the Warren River.

Distribution and Habitat: Known only from the type locality c. 5 km inland from the coast and west of Northcliffe in far south-western Western Australia and from an old record further east at Esperance Bay (Fig. 3e). Grows on unstable, drifting dunes where it is a pioneering species with *Poa poiformis*.

Notes: Although closest to *S. spathulatus* in terms of fleshiness of the leaves and size of capitula and achenes, *S. warrenensis* is reminiscent of *S. pinuatifolius* var. *latilobus* in terms of the relatively broad, overlapping, and chevronned calycular bracteoles and the paler coloration of the phyllaries on drying.

Selected specimens examined: WESTERN AUSTRALIA: Warren drift sands, *P.C. Heyligers* 88140, 12.ix.1988 (CANB); Esperance Bay, *coll unknown*, date unknown (MEL 2168061).

4. *Senecio pinuatifolius* A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 117 (1834)

S. laetus f. *pinuatifolius* (A.Rich.) Hochr., *Caudollea* 5: 336 (1934).

Type: Tasmania, D'Entrecasteaux Channel ['Detroit D'Entrecasteaux'], A. Lessou, 1828–29; *holo:* P.

Annual or perennial to 2.0 m tall, erect, sprawling or prostrate, sometimes rhizomatous (var. *alpinus*), largely glabrous. *Taproot* slender to stout; secondary roots usually fine throughout. *Leaves* in mid-region of stems or major branches 0.5–12 cm long, with marginal points 0–40 per side, divided or not, thin to fleshy, succulent on coast; base commonly narrow or attenuate, sometimes developing small basal segments; margin entire or dentate, serrate or denticulate; unsegmented leaves oblong to filamentous, narrow to very narrow-elliptic, or oblanceolate to narrow-oblanceolate; segmented leaves with 1–8

triangular or narrow-oblong to filamentous lobes or segments per side, with rachis to 5 mm wide, sometimes again divided, average position central to somewhat distal. *Uppermost leaves* sometimes lanceolate; base sometimes developing narrow segments or broad rounded auricles and mildly stem-clasping. *Inflorescences* of 1–40 capitula; peduncle sometimes somewhat hairy. *Capitula*: calycular bracteoles 6–16, imbricate or not at anthesis, lanceolate to broad-ovate, 0.5–3.5 mm long, 0.3–2.2 mm wide, with margin glabrous or variously hairy; apex subacute to acute, pigmented black, purple or light purple, with patch 0.2–1.2 mm long, sometimes chevronned; involucre 3.0–7.5 mm long, 2–5 mm diam.; phyllaries mostly c. 13, occasionally predominantly c. 20, with apex weakly to strongly pigmented brown, black or purple; stereome occasionally sparsely hairy, variably fleshy, sometimes succulent, drying dark or pale; resin ducts variably developed, pale to orange on drying or obscure; inner phyllaries: broader stereomes 0.8–1.5 mm wide, sometimes chevronned apically, margin 0.2–0.5 mm broadening to 0.4–0.8 mm wide proximally; outer phyllaries: margin vestigial or to 0.3 mm wide broadening to 0.1–0.5 mm wide proximally. *Florets* 30–100; ligulate florets 8–13, sometimes several fewer than phyllaries, with ligule 6–20 mm long; corolla of disc florets 3–7 mm long. *Achenes* $\pm$ homomorphic, 30–70% of length of phyllaries, (1.6–)2.0–4.5 mm long, golden, light to dark brown, olive or sometimes reddish (achenes of ray florets), with ribs often convex; papillose hairs sparse to moderately dense in bands obscuring up to 90% of surface, appressed to divergent, with l:w ratio 4–6, or achenes glabrous; hairs of achenes of ray florets exceeding pappus-ring or not. *Pappus* generally not persistent, 3–6 mm long.

Flowers mostly late winter to summer.

Notes: A highly variable species occurring mostly within c. 300 kilometres of the coast. It occurs predominantly in areas of moderate to high rainfall, but it does occur in arid or semiarid environments on the west and south coasts of Western Australia and the south coast of South Australia. The following infraspecific classification does not fully resolve the variation in *S. pinnatifolius*. Eight varieties of *S. pinnatifolius* are recognised here, with var. *pinnatifolius* containing a greater diversity of forms than the other varieties. The overall distribution of the species is presented in Fig. 16a.

Key to varieties of *Senecio pinnatifolius*

Leaves, unless otherwise indicated, refers to leaves in the middle third of stems and major branches. Proper examination of the phyllaries and bracteoles will generally require magnification. Inner phyllaries commonly alternate with outer phyllaries and the two types will often be placed side-by-side; however, intermediate phyllaries (see Terminology) are also frequent and need to be distinguished.

- 1 Leaves bi- or tri-pinnatisect; stems succulent; capitula and leaves rather crowded; ligules not or hardly longer than involucre in pressed specimens (Bass Strait islands) **4c. var. *capillifolius***
- 1: Leaves undivided to pinnatisect or if rarely bipinnatisect, then stems not or hardly succulent; capitula and leaves crowded or lax; ligules generally distinctly longer than involucre in pressed specimens (widespread)
 - 2 Distal portion of stereome of inner phyllaries usually bordered by a purple chevron, more than twice as broad as stereome of outer phyllaries (both measured c. 1 mm below apex); margin of outer phyllaries c. as broad as stereome 1 mm below apex; tap-root generally poorly developed (southern Victoria and adjacent parts of South Australia and New South Wales, northern Tasmania, including Bass Strait Islands) **4d. var. *lanceolatus***
 - 2: Distal portion of stereome of inner phyllaries not or occasionally faintly bordered by a purple chevron, generally less than twice as broad as stereome of outer phyllaries (both measured c. 1 mm below apex); margin of outer phyllaries narrower than stereome 1 mm below apex; tap-root often well-developed (widespread)

- 3 Calycular bracteoles 10–16, broad-ovate to ovate, > 0.8 mm wide at mid-point and length less than twice the width at mid-point, largely hyaline; apex of sterome of inner phyllaries commonly with a fine chevron (far south-western Western Australia) 4b. var. *latilobus*
- 3: Calycular bracteoles 6–12, ovate to lanceolate, either < 0.8 mm wide at mid-point or length more than twice the width at mid-point, usually predominantly herbaceous; chevron generally absent (widespread)
- 4 Leaves thin, markedly discolorous; marginal points, mostly as serrulations, generally 15 or more per side; upper-branch leaves with base not narrower than mid-leaf (forests of northern New South Wales and southern Queensland) 4e. var. *serratus*
- 4: Leaves usually somewhat fleshy and or succulent, not or only slightly discolorous; marginal points fewer than 15 per side, or if more then upper-branch leaves with base narrower than mid-leaf (widespread).
- 5 Plants rhizomatous or not, with aerial stems sometimes unbranched; leaves oblanceolate in outline and/or marginal points and segments clearly more numerous beyond mid-leaf; usually both peduncle and margin of calycular bracteoles moderately pubescent (montane to alpine regions).....4f. var. *alpinus*
- 5: Plants not rhizomatous, with stems generally branched; leaves not as above or if so then not peduncle and margin of bracteole not both pubescent
- 6 Leaves crowded, fleshy, 1–2 cm long; achenes c. 4 mm long, with surface completely obscured by hairs (Dempsters Inlet, southern Western Australia) 4h. var. *leucocarpus*
- 6: Leaves various; achenes not entirely as above (distribution various)
- 7 Leaves generally only slightly fleshy, pressing fairly thin; leaves often developing straplike basal segments from a narrow rachis; rachis of upper-branch leaves generally narrower than stem at base; achenes to 4.5 mm long, usually c. half to two-thirds of the length of phyllaries 4a. var. *pinnatifolius*
- 7: Leaves fleshy, pressing thick, and often coarsely wrinkled; leaves not developing straplike basal segments from a narrow rachis; rachis of upper-branch leaves often as broad as or broader than stem at base; achenes to 3 mm long, generally less than half the length of phyllaries
- 8 Sprawling to prostrate plants; length:width ratio of rachis of leaves mostly 1–10; hairs of achenes of ray florets exceeding pappus-ring (southern coast, including western Tasmania) 4g. var. *maritimus*
- 8: Erect plants; length:width ratio of rachis of leaves 6–50; hairs of achenes of ray florets not exceeding pappus-ring (Western Australia).....4a. var. *pinnatifolius*

4a. *Senecio pinnatifolius* A.Rich. var. *pinnatifolius*

The types of many of the following synonyms have not been seen or are deemed inadequate for identification. They are tentatively placed here as synonyms based on their provenance and on descriptions given in Bealeher (1994).

?*S. gaudichaudianus* A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 98 (1834). Type: Port Jackson, N.S.W., 1819, *Gaudichaud-Beaupré* 7; holo: P n.v., *fide* R.O. Bealeher, *op. cit.* 84.

S. tripartitus A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 114 (1834); *S. tripartitus* Steud., *Nom. Bot.* 2nd edn, 2: 566 (1840), *nom. illeg.* Type: Port Jackson,

New South Wales, 1828-29, A. Lesson; lecto: P *fide* R.O. Belcher, *op. cit.* 81.

S. crithmifolius A. Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 116 (1834), *nom illeg. non Scop.* (1772). T: 'Ile des Dangarous et Iles Steriles', Australia; holo: P *n.v.*, *fide* R.O. Belcher *op. cit.* 81, 84.

S. macquariensis DC., *Prodr.* 6: 372 (1838). Type: Banks of the Macquarie River, N.S.W., Apr. 1817, A. Cunningham 143; holo: G *n.v.*, *fide* R.O. Belcher, *op. cit.* 81 (1994).

S. endlicheri DC., *Prodr.* 6: 373 (1838), as *Endlicheri*. Type: New Hollandia [Australia], 1834, Endlicher 1; holo: G *n.v.*, *fide* R.O. Belcher, *op. cit.* 81.

S. oligocephalus DC., *Prodr.* 6: 373 (1838). Type: [probably] N.S.W., Sieber; G *n.v.*

S. lautus subsp. *dissectifolius* Ali, *Austral. J. Bot.* 17: 168 (1969), *pro parte excl.* type; G.J. Harden, *Fl. New South Wales* 3: 309 (1992)

S. lautus subsp. *maritimus* Ali, *Austral. J. Bot.* 17: 171 (1969), *pro parte excl.* type; G.J. Harden, *Fl. New South Wales* 3: 309 (1992).

Plants to c. 1.5 m tall, erect, sprawling or prostrate, with tap-root usually moderately to well-developed. *Leaves* in mid-region of stems and major branches 1.5–10 cm long, with marginal points 0–20 per side, divided or not, thin, fleshy or succulent; base attenuate or narrow, sometimes with basal segments or lobes; margin entire or teeth or denticulations sparse to frequent; undivided leaves oblanceolate, narrow-oblanceolate, linear or narrow-linear, with rachis 0.5–12 mm wide; pinnatisect leaves with 1–5 segments per side, with average position various; segments narrow-oblong to filamentous, entire or with a few denticulations, rarely lobed. *Uppermost leaves*: base remaining narrow or sometimes slightly dilated, with basal segments commonly developed. *Inflorescences* of 1–20 capitula; bract-axils with hairs inconspicuous; peduncle glabrous or occasionally with short, coarse hairs. *Capitulum*: calycular bracteoles 6–10, usually not imbricate at anthesis, ovate to narrow-ovate, 1.0–2.0(–2.5) mm long, 0.3–1.2 mm wide, with hyaline margin variably broad, glabrous or with generally weak hairs, pigmented light or dark purple apically or unpigmented, with patch c. 0.2–0.5 mm long; involucre 3.0–7.5 mm long, 2–5 mm diam.; phyllaries mostly c. 13 or mostly c. 20, rarely a minority of capitula in an inflorescence with fewer than 13; apex brown, black, purple or unpigmented; stercome slightly to moderately fleshy or succulent, drying yellow-green or brown; resin ducts commonly well-developed, orange, sometimes obscure; inner phyllaries: chevron typically absent; margin c. 0.1–0.2 mm wide 1 mm below apex broadening to 0.3–0.5 mm wide proximally; outer phyllaries: margin c. 0.1 mm wide distally widening to c. 0.2–0.4 mm wide proximally. *Ray florets* 8–13, as numerous as or fewer than phyllaries. *Achenes* 2.0–4.5 mm long, generally c. 40–70% of length of phyllaries, olive-brown, brown or golden; ray achenes sometimes reddish, with papillose-hairs in narrow or broad bands, or achenes glabrous; hairs of achenes of ray florets mostly not exceeding pappus-ring. (Fig. 8)

Distribution and Habitat: Occurs in eastern and western Australia mostly within 400 km of the coast. In eastern Australia it extends from Rodd's Peninsula in south-eastern Queensland south through eastern New South Wales to eastern Victoria; in South Australia it occurs in the Mount Lofty Ranges in the south-east, and in Tasmania it is widespread. In Western Australia it occurs around Carnarvon and in the far south-west from Mt Yetar east of Perth south-south-east to Bremer Bay and further east around Cape Arid. There are isolated records in south-central and south-western Victoria at Wilsons Promontory and Portland (Fig. 7a). Grows in a range of environments, including dry hills and coastal dunes, in forest, woodland and scrubland.

Notes: This variety represents a complex of subtly different forms that currently resist discrimination. Although morphologically similar, it is uncertain whether eastern and western forms are closely related. The following forms are generally the most readily recognisable and have been well-collected.

In the Carnarvon district on the west coast of Western Australia, plants have a long, slender taproot, a lower stem that develops a silvery bark, relatively large capitula, small bracteoles, and relatively short achenes.

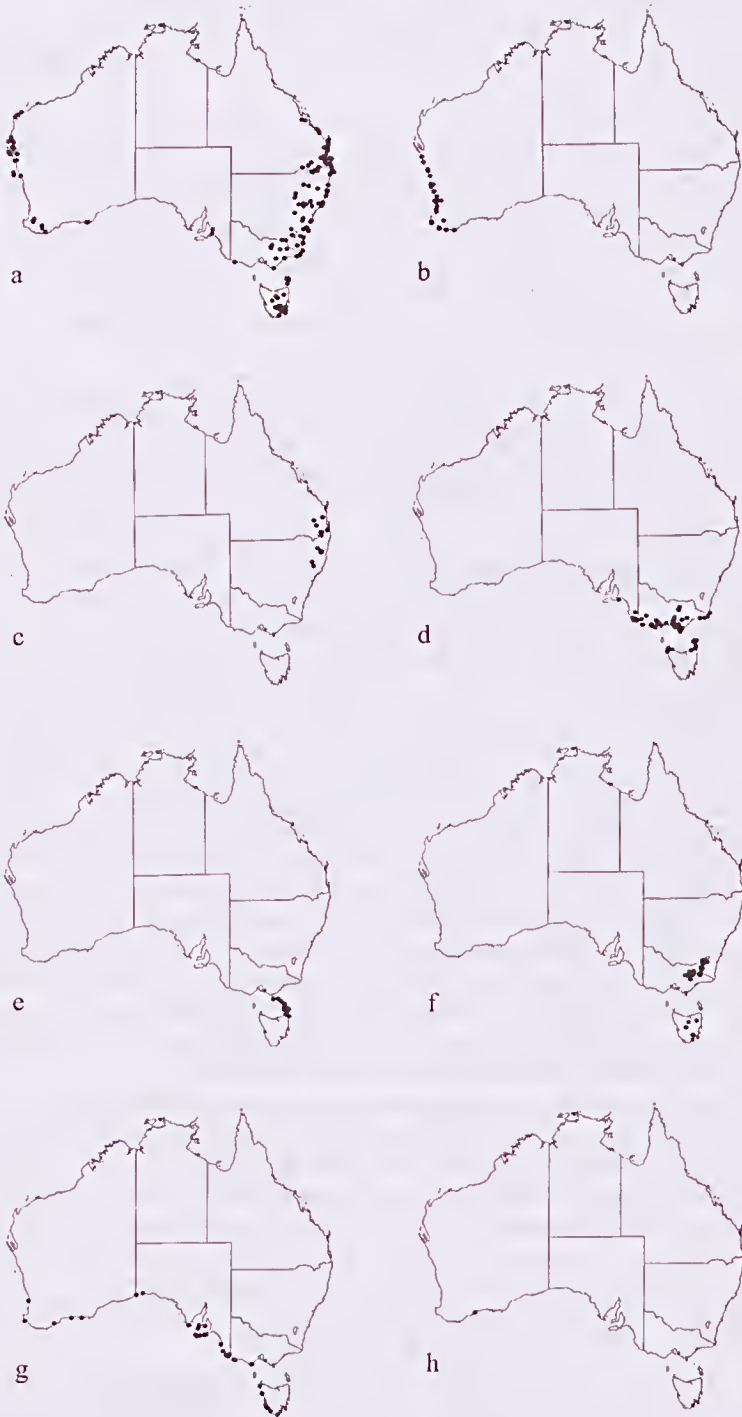


Figure 7. Distribution of varieties of *Senecio pinnatifolius*: a. var. *pinnatifolius*; b. var. *latilobus*; c. var. *serratus*; d. var. *lanceolatus*; e. var. *capillifolius*; f. var. *alpinus*; g. var. *maritimus*; h. var. *leucocarpus*.



Figure 8. *S. pinnatifolius* var. *pinnatifolius* (holo: A. Lesson P).

A form from drier inland parts of central-eastern and north-eastern New South Wales and south-eastern Queensland has very narrow, often filamentous leaf segments, relatively few, small capitula and often has capitula with c. 20 phyllaries. This form is similar to *S. spanoumerus*; however, the latter has leaves with a broader rachis and segments and leaves do not develop narrow basal segments from a narrow base, its inflorescences have more capitula, the capitula are slightly larger, and calycular bracteoles are longer and often with coarse white hairs on the margins. A similar form occurs in woodlands east and south-east of Perth in south-western Western Australia. In north-eastern Victoria, another form of var. *pinatifolius* with filamentous leaf segments commonly has relatively large capitula with c. 20 phyllaries.

A widespread form (recognised as *S. laetus* subsp. *maritimus* sensu G.J. Harden in Flora of New South Wales vol. 3, 1992) extending along the coasts of southern Queensland, New South Wales and eastern Tasmania has somewhat succulent leaves and the rachis is usually narrowly oblanceolate. Achenes are typically relatively long and slender, extending more than half the length of the phyllaries. This form is referable to *S. tripartitus* A.Rich. Compared to *S. pinatifolius* var. *maritimus*, which occurs on the southern mainland coastline, its leaves are less fleshy, narrower basally, with generally more marginal points, and often with slender basal segments, and its achenes are distinctly longer and relatively slender, with finer, shorter hairs in narrower grooves.

Much of the material from Queensland, New South Wales and Tasmania until recently identified as *S. laetus* subsp. *dissectifolius* or *S. laetus* subsp. *maritimus* is *S. pinatifolius* var. *pinatifolius*.

A few collections assigned to var. *pinatifolius* from the Cape Arid region and Mondrain Island in the Recherche Archipelago in southern Western Australia are tall perennials (to 1.5 m tall). Further collections from this area are desirable.

Selected specimens examined: WESTERN AUSTRALIA: 2 km E of Miaboola Beach, about 10 km N of Carnarvon, R. Story 8225, 9.ix.1976 (MEL, PERTH); Sand-dunes at Point Quobba, P.S. Short 2052, 14.x.1983 (MEL, PERTH); Monkey Mia, P.S. Short 2466, N.S. Lauder, & B.A. Fuhrer, 16.viii.1986 (AD, MEL, PERTH); Site 12, off Yarra Road, 4.8 km NW of Mount Yetar, M.G. Allen 58, 5.xi.1996 (PERTH). QUEENSLAND: E-most point of North Stradbroke Island, Point Lookout headland, near the township of Point Lookout, I. Radford s.n., 8.ix.1993 (BRI, CANB, NSW) c. 10 km W of Warwick on Cunningham highway, then 1 km from turnoff towards Goondiwindi, field on left side of road, I.J. Radford s.n., 15.ix.1993 (BRI, CANB); E of 'Fair Hills' SW of Cooyar, A.R. Bean 10599, 24.viii.1996 (BRI); Beside rough track above White Cedar Picnic Area Northbrook Parkway, S.P. Phillips 224, 12.vi.1999 (BRI); Enoggera, F.M. Bailey (BRI); 5 miles [8 km] N of Toobeah, L. Pedley 786, 27.vi.1961 (BRI, MEL); Stanthorpe, 5 km from PO, end of Nelson Cres., off the road to Texas, L.W. Cayzer 828, S. Donaldson, & S. Pedersen, 18.v.1999 (CANB); Darling Downs District, Glen Aplin, S.L. Everist & L.J. Webb 1346, 22.xi.1946 (BRI, CANB); SW of Mt Nebo, D'Aguilar Range, I.R. Telford 693, 21.v.1969 (CANB); W slopes of Mt Mermaid, NW of Brookfield, I.R. Telford 1595, 13.v.1970 (CANB). NEW SOUTH WALES: Back Beach, Trial Bay, P.C. Heyligers 85032, 1.xii.1985 (CANB); Hat Head National Park, near Hat Head township, K. McDougall 805 & R. McDougall, 15.vii.2000 (MEL); Tacking Point, Port Macquarie, A. Maguire 1, 30.iv.1993 (CANB, MEL, NSW, UNE); S Coast: ca. 3 km N of Bermagui, L.G. Adams 3188, 12.iv.1973 (CANB); Sand dunes between Tuncurry Beach Caravan Park and sea, J.R. Hosking 739 & R. Hohkamp, 20.iv.1993 (CANB, MEL, NE, NSW); Evans Head, M.E. Phillips s.n., 18.viii.1963 (CANB); Jervis Bay National Park, Steamers Beach, N.M. Taws 636, 11.x.1996 (CANB); Baragoot Beach, P.C. Heyligers 85009, 31.viii.1985 (CANB); 5 km N of Moruya, on coast adjacent to aircraft runway, I. Radford s.n. & D. King, Sept. 1992 (AD, BRI, HO, MEL, NE, NSW, PERTH); Mt Kaputar National Park, c. 10 km from Visitors Information Centre along Narrabri to Mt Kaputar road, P.S. Short 3945, K. Watanabe, T. Yahara, T. Denda & Y. Suzuki, 28 Jan 1993 (AD, CANB, DNA, MEL, NSW); 34.3 km from Narrabri toward Mt Kaputar, B. Muffet M3/84, 24.viii.1974 (CANB); Bulga CR, 16 miles [25 km] from Singleton on Putty Road, D.W. Shoobridge, 27.vii.1961 (CANB); Warrumbungles National Park, C.R. Dunlop CRD610, 21.viii.1969 (CANB); North west of Woodsreef mine alongside road near Ironbark Creek, J.R. Hosking 524, 27 Aug. 1992 (CANB, MEL, NE, NSW); White Box Camp, in Goulburn River National Park, off Bylong-Merriwa Road,

S.M. Prober s.n., 4.ix.1990 (CANB); 3.8 km E of Yetman on Bruxner Highway, *C.W.E. Moore* 9300, 19.x.1992 (CANB); Split Rock, 24 km NW of Coonabarabran, *H. Sreimann* 675, 9.xii.1973 (CANB, NSW); c. 50 km (direct) E of Forbes, Eugowra-Cudal Road, W of Cudal just before Murga Sawmill, *R. Consens s.n.*, Sep. 1992 (CANB, NSW). **VICTORIA**: Extreme north-eastern face of Pine Mtn, approx. 12 km from Walwa, *L. Wheeler* 199, 6.xii.1975 (CANB); Blue Range Reference Area, Mount Samaria State Park, *A.C. Beanglehole* 91090 & *N.T. Rossiter*, 7.xi.1987 (MEL); About 19 km ESE of Benalla. Just E of Greens Road, about 4 km S of Upper Lurg, *H.J. Aston* 2571, 26.x.1985 (MEL); Croajingolong National Park, near mouth of Seal Creek, *D.E. Albrecht* 4852, 22.x.1991 (AD, CANB, MEL); Shell Beach, Bridgewater Bay, near Portland, *R. Melville* 1489, *C. Beanglehole*, *P. Finck* & *E. Finck*, 11.x.1952 (MEL). **TASMANIA**: Bedlam Walls, *A. Moscal* 16605, 9.x.1988 (HO); Grassie Hill Road, 'saddle', *A.M. Gray* 945, 6.iv.1999 (HO); Blackman's Bay, *J. Somerville*, 15.viii.1933 (HO); South Ridge of Mt Hobbs, *P. Collier* 2021, 14.xii.1986 (HO); Roaring Beach Bay, Tasman Peninsula, *A.E. Orchard* 5239, 15.i.1981 (AD, HO, MEL, NSW); Near Hope Beach, on cliffs above Black Jack light, *M.E. Phillips* 379, 8.xi.1960 (CANB); Ile du Golfe, *C.G. Short*, 21.i.1987 (HO); Flat Top Island, *N. Brothers s.n.*, 3.xi.1983 (HO); Maatsuyker Island, *P. Blackwell s.n.*, 1977 (HO); Gull Reef, Port Davey, *M. Allan s.n.*, 24.i.1977 (HO)..

4b. *Senecio pinnatifolius* var. *latilobus* (Steetz) I.Thomps., *comb. nov.*

S. carnulentus var. *latilobus* Steetz, in J.G.C. Lehmann, *Pl. Preiss.* 1: 485 (1845), as *latiloba*.

Type: Western Australia, near Perth ['in arenosis subumbrosis sylvac ad lacun Dunjambur, prope oppidulum Perth'], *L. Preiss* 110, 16 July 1839; lecto: W.n.v., *fide* R.O. Belcher, *Austral. Syst. Bot.* 7: 77 (1994); isolecto: MEL.

S. carnulentus var. *angustissimus* Steetz, in J.G.C. Lehmann, *Pl. Preiss.* 1: 485 (1845), as *angustissima*. *Type*: Western Australia, Rottnest Island ['in arenosis insulae Rottnest'], *L. Preiss* 109, 20 Aug. 1839; lecto: MEL, *fide* R.O. Belcher, *Austral. Syst. Bot.* 7: 77 (1994).

Plants to 0.6 m tall, erect, often taller than broad, with tap-root well-developed. *Leaves* in mid-region of stems and major branches 3–10 cm long, with marginal points 2–12 per side, usually divided, thin to subfleshy; base usually narrow, with segments not developed; margin entire, denticulate or serrate; undivided leaves narrow-elliptic or narrow-linear, with rachis 0.5–12 mm wide; divided leaves with up to 4 narrow-oblong to linear segments per side. *Uppermost leaves*: base sometimes dilated and slightly stem-clasping, sometimes with segments developed. *Inflorescences* of 3–20 capitula; bract-axils often with conspicuous hairs; peduncles glabrous or nearly so. *Capitula*: calycular bracteoles 10–16, sometimes imbricate at anthesis, ovate to broad-ovate, 1.5–3 mm long, 0.8–2.2 mm wide, glabrous or less often with coarse hairs, pigmented usually purple or brown apically, sometimes with chevron; involucre 3.5–5.5(–6.5) mm long, 3–4 mm diam.; phyllaries predominantly c. 13, with apex pale brown or purple; stereome slightly fleshy, drying green or yellow-green; resin ducts usually indistinct, pale; inner phyllaries: chevron often present, fine; margin c. 0.2 mm wide 1 mm below apex broadening to 0.3–0.5 mm wide proximally; outer phyllaries: margin c. 0.1 mm wide 1 mm below apex broadening to c. 0.2 mm wide proximally. *Ray florets* mostly c. 13, c. equal to number of phyllaries. *Achenes* 2.0–3.0 mm long, generally c. 40–50% of length of phyllaries, with papillose hairs in broad bands obscuring most of surface; hairs of achenes of ray florets not exceeding pappus-ring. (Fig. 9)

Distribution and Habitat: Occurs in south-western Western Australia on or near the coast and on nearby islands, from Geraldton south to the far south-west corner and from there extending east as far as Albany (Fig. 7b).

Notes: This variety is characterised by the numerous, relatively broad and largely hyaline calycular bracteoles, and to a lesser extent by its erect habit, well-developed taproot, and the fine chevron often outlining the stereome of the inner phyllaries. The calycular bracteoles, because of their number and width, are frequently imbricate at anthesis. The chevron of var. *latilobus* is more acute than that of var. *lanceolatus* because



Figure 9. *S. pinnatifolius* var. *latilobus* (A.M. James 2 PERTH).

the stereome of the former tapers more distally. The pinnatisect form of this variety is the commonest form. Although having larger bracteoles, it is otherwise very similar to the form of *S. pinnatifolius* var. *pinnatifolius* that occurs north of Geraldton, and the two taxa appear to intergrade where their distributions overlap. Another form occurs predominantly on islands off the west coast of Western Australia in guano-rich environments. It is more succulent than the typical form, and commonly has narrow-elliptic leaves with a broad rachis and serrulate margins, and relatively congested capitula.

Selected specimens examined: WESTERN AUSTRALIA: Spearwood, B.J. Grieve, 18.x.1953 (PERTH); Yanchep National Park between Gloucester Lodge and Main Road, A.M. James 217, Oct. 1963 (PERTH); City Beach, Perth, T.E.H. Aplin 988, 5.ix.1961 (MEL, PERTH); Mullaloo Beach Road, H. Demarz 2727, 21.x.1970 (CANB, PERTH); Fortview Road, Swanbourne, R.J. Cranfield 378, 24.viii.1978 (CANB, PERTH); Western slope of Reabold Hill, Floreat Park, J. D'Alonzo 93, 29.viii.1985 (CANB, PERTH); Denmark Shire, Bibbulum Track c. 1.5 km east from Lights Beach carpark, B.G. Hammersley 1828, 31.x.1997 (PERTH); 3 miles [5 km] east of Jurien Bay (ca. 126 miles [170 km] direct) NNW of Perth, R.V. Smith 66/172, 1.ix.1979 (MEL); Green Island, off Rottnest Island, E. Rippey 136, 6.ix.1999 (PERTH).

4c. *Senecio pinnatifolius* var. *serratus* I.Thomps., var. nov.

A varietate typica foliis tenuioribus lamina latiore dentibus pluribus differt.

Type: Queensland, Acacia Plateau, L.J. Webb 2464, 5 Mar. 1951; holo: CANB.

S. lantus subsp. *lanceolatus* (Benth.) Ali, *Austral. J. Bot.* 17: 173 (1969), *pro parte* excl. type; G.J. Harden, *Fl. New South Wales* 3: 309 (1992), *pro parte* excl. type.

Plants to c. 1 m tall, typically erect, with tap-root moderately developed. *Leaves* in mid-region of stems and major branches 5–15 cm long, with marginal points 10–30 per side, divided or not, thin on drying; base attenuate to cuneate; margin serrate, serrulate or denticulate; undivided leaves narrow-elliptic, with rachis 5–30 mm wide; divided leaves with 1–3 narrow-oblong to linear segments per side. *Uppermost leaves* becoming narrow-oblong to lanceolate upwards; base truncate to cordate and weakly stem-clasping. *Inflorescences* of 3–20 capitula; bract-axils with hairs inconspicuous or moderately developed; peduncles glabrous or with scattered coarse hairs. *Capitulum:* calycular bracteoles 6–10, usually not imbricate at anthesis, narrow-ovate to lanceolate, 1.5–2.5 mm long, 0.8–1.3 mm wide, margin glabrous or with weak hairs, pigmented dark purple apically, with mark c. 0.5–1.0 mm long; involucre 4.0–6.0 mm long, 3–4 mm diam.; phyllaries c. 13, with apex black or dark purple; stereome slightly fleshy, drying olive-green to bronze; resin ducts well-developed; inner phyllaries: chevron absent; margin c. 0.2–0.3 mm wide 1 mm below apex broadening gradually to 0.3–0.5 mm wide proximally; outer phyllaries: margin vestigial to 0.1 mm wide 1 mm below apex broadening to 0.1–0.2 mm wide proximally. *Ray florets* 8–13, c. equal to or fewer than phyllaries. *Achenes* 2.5–3.2 mm long, generally c. 50–60% of length of phyllaries, olive-brown, brown or blackish-brown, with papillose hairs confined to grooves, or achenes glabrous; hairs of achenes of ray florets not exceeding pappus-ring. (Fig. 10)

Etymology: The epithet alludes to the margin of the leaves (*L. serratus*, serrate)

Distribution and Habitat: Occurs in south-eastern Queensland south from the Bunya Mountains and in north-eastern to central-eastern New South Wales as far south as Barrington Tops (Fig. 7e). Grows in forests, often at margins of rainforest, and sometimes in cleared areas.

Notes: The leaf morphology of var. *serratus* is similar to that of var. *lanceolatus*. However, the former has different phyllary morphology and its inflorescences generally have fewer capitula. Var. *serratus* is also similar to var. *alpinus* but the leaves differ in the shape and in the position of marginal points. In Barrington Tops, the leaves of this variety are generally less conspicuously serrulate than in populations further north.



Figure 10. *S. pinnatifolius* var. *serratus* (holo: L.J. Webb CANB).

Selected specimens examined: QUEENSLAND: Great Dividing Range E of Warwiek, a few km W of Queen Mary Falls on the road from Killarney, roadside, *I. Radford s.n.*, 15.ix.1993 (BRI, CANB); O'Reilly's, Lamington National Park, *L.S. Smith & L.J. Webb 3586*, 10.v.1948 (BRI, CANB); Bunya Mountains, *M.E. Phillips s.n.*, 5.vi.1961 (CANB); Mt Gipps, *C.T. White 12081*, 11.iv.1941 (BRI, CANB). NEW SOUTH WALES: Glen Elgin, *J.W. Haney s.n.*, 15.iv.1930 (CANB); Northern Tablelands, New England National Park, Darkie Point, *P. Gilmour 7085*, 14.v.1990 (CANB, NSW); Northern Tablelands: Barrington Tops, Carey's Peak, *I.R. Telford 2730A*, 12.ii.1971 (CANB).

4d. *Senecio pinnatifolius* var. *lanceolatus* (Benth.) I.Thomps., *coub. uov.*

S. lautus var. *lanceolatus* Benth., *Fl. Austral.* 3: 667 (1867); *S. lautus* subsp. *lanceolatus* (Benth.) Ali, *Austral. J. Bot.* 17: 173 (1969).

Type: Victoria, Port Phillip, *Adamsou*; lecto: K, photo seen CANB [The lectotype was presumably chosen by Ali but this is not explicitly stated in his paper]; Port Philip, *R.C. Gunn s.n.*; syn: K, photo seen CANB.

S. pinnatifolius var. 3 *sensu* N.G. Walsh, *Fl. Victoria* 4: 949 (1999).

S. pinnatifolius var. *pinnatifolius sensu* N.G. Walsh, *Fl. Victoria* 4: 948 (1999), *pro parte*.

S. pinnatifolius var. 2 *sensu* N.G. Walsh, *Fl. Victoria* 4: 948 (1999), *pro parte*.

Plants to 1.5(–2) m tall, commonly erect, sometimes sprawling, with tap-root poorly developed. *Leaves* in mid-region of stems and major branches 3–15 cm long, with marginal points 8–40 per side, divided or not, thin to subfleshy, or succulent on coast; base attenuate, without segments; margin variously toothed, the teeth often somewhat crowded antrorse and elongate; undivided leaves narrow-oblongate, narrow to very narrow-elliptic, or $\pm$ linear, rachis 2–30 mm wide; divided leaves with (1–)2–7 lanceolate, narrow-oblong, or c. linear segments per side, average position c. midleaf, sometimes again divided. *Uppermost leaves* narrow-oblong, ovate or lanceolate; base often cordate, stem-clasping, with segments often developed. *Inflorescences* of 3–40 capitula; bract-axils often with long coarse hairs; peduncles glabrous or with long hairs. *Capitulum:* calycular bracteoles 6–14, imbricate or not at anthesis, ovate to narrow-ovate, 2.0–3.5 mm long, 0.8–1.6 mm wide, with margin often coarse-hairy, usually pigmented dark purple apically, with mark c. 0.5 mm long, sometimes chevronned; involucre 4.0–7.0 mm long, 3–6 mm diam.; phyllaries mostly c. 13, with apex purple; stereome slightly fleshy, drying dark-green or brown, succulent in coastal plants; resin ducts indistinct, pale; inner phyllaries: chevron usually well-developed, to 1.5 mm long, sometimes notched, outlining the distally relatively broad and partially pale (on drying) stereome; margin c. 0.25–0.4 mm wide 1 mm below apex broadening to 0.3–0.6 mm wide proximally; outer phyllaries: margin c. 0.2 mm wide 1 mm below apex broadening to c. 0.3 mm wide proximally. *Ray florets* c. 13, c. equal to phyllaries. *Achenes* (1.6–)2.0–3.2 mm long, generally c. 40–50% of length of phyllaries, brown, coppery-brown or green, with papillose hairs in narrow to broad bands, or achenes glabrous; hairs of achenes of ray florets exceeding pappus-ring or not. (Fig. 11)

Distribution and Habitat: Occurs in far south-eastern South Australia, throughout southern Victoria, in far south-eastern New South Wales, and in northern Tasmania including islands in Bass Strait (Fig. 7d). Grows in forest, woodland and shrubland in lowland to hilly environments.

Notes: This variety differs from the other varieties most significantly in phyllary morphology, in particular in having inner phyllaries marked with a purple chevron, the relatively large disparity in width between the stereomes of the inner and outer phyllaries (measured c. 1 mm below the apex); and the relatively broad hyaline margin distally of the outer phyllary (compare Figs 2a and 2c). Also in this variety the leaves tend to have a relatively high number of marginal points, the number of capitula per inflorescence is often high, and the taproot poorly developed. The chevron in var. *lanceolatus* is often just

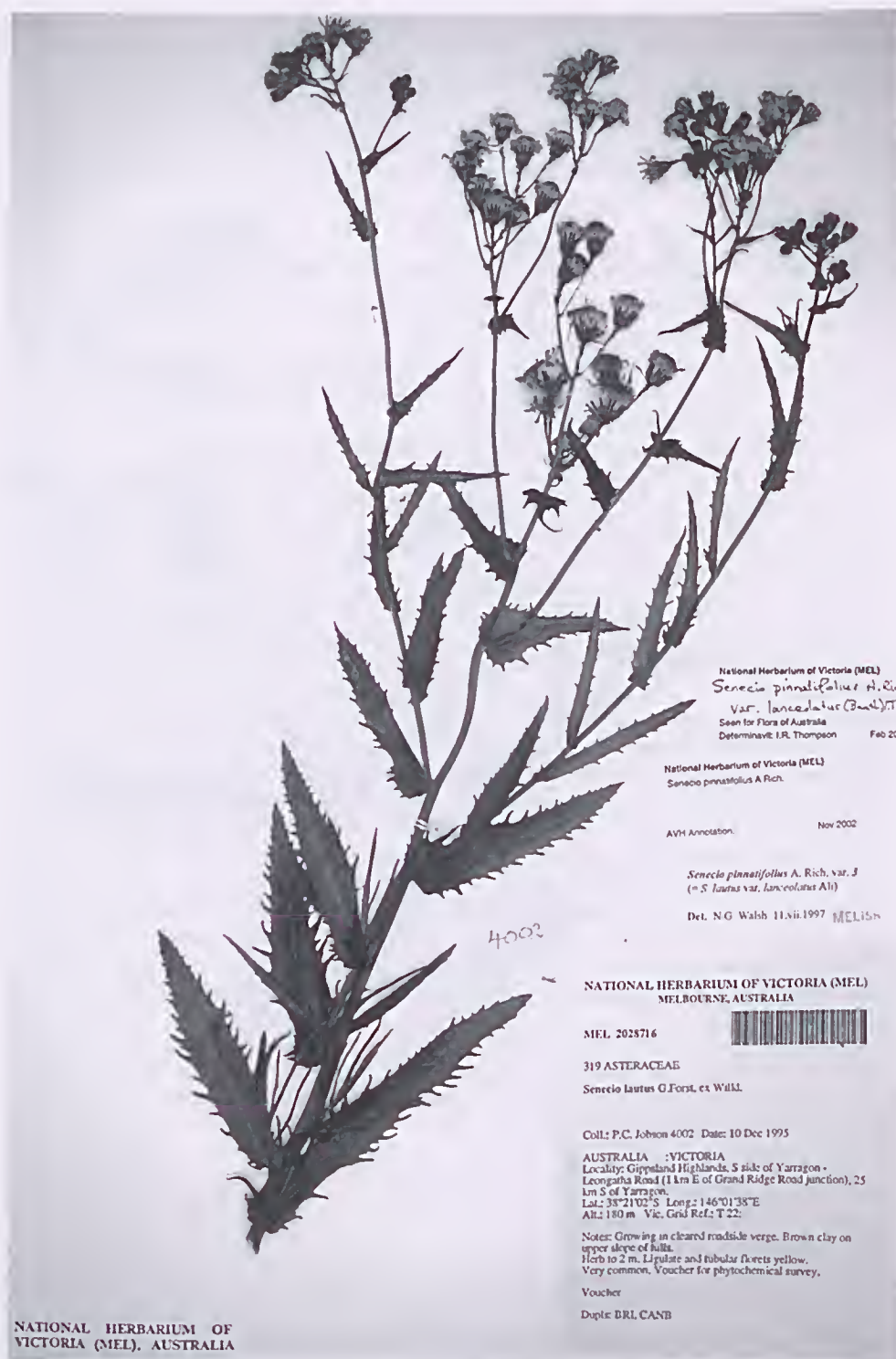


Figure 11. *S. pinnatifolius* var. *lanceolatus* (P.C. Jobson 4002 MEL).

discernible with the naked eye. In dried specimens, the relatively broad distal portion of the sterome that the chevron outlines is green centrally, but there is usually a pale zone between this green portion and the chevron (Fig. 2a).

As is typical of lautusoid taxa, the degree of leaf division can vary enormously in some populations (Fig. 1c). On the other hand, populations of purely serrate-leaved plants (Fig. 1f) or purely pinnatisect-leaved plants also occur.

A few forms of var. *lanceolatus* have been identified. A form from south-western Victoria and adjacent parts of south-eastern South Australia has relatively small capitula. Relatively robust forms occur in basaltic areas of south-western Victoria often growing at lake margins and in higher rainfall areas east of Melbourne, and these generally have glabrous or sparsely hairy achenes. A coastal form, e.g. from Cape Schanck in southern Victoria, has leaves with a relatively low length:width ratio.

Plants of var. *lanceolatus* growing on coastal dunes have smaller more succulent leaves with reduced numbers of marginal points; these were identified as *S. pinnatifolius* var. 2 by Walsh (1999).

Selected specimens examined: **SOUTH AUSTRALIA:** State Forest, National Trust Lease, adjacent to western side of Lower Glenelg National Park, J.Z. Weber 7783, 24.x.1982 (AD); The Bluff, Tantanoola, R.J. Bates 26317, 24.xi.1991 (AD); Myponga to Victor Harbour Swamps, in shaded area in deep gully toward Spring Mt., R. Bates 3554, 22.xii.1983 (AD). **NEW SOUTH WALES:** South Coast: Nadgee Nature Reserve; Nadgee Lake, P. Gilmour N26, 6.x.1982 (CANB); Wonboyn Beach, M.E. Phillips, 9.x.1961 (CANB); South Coast near the mouth of Saltwater Ck, south of Eden, D.E. Albrecht 722, 16.ix.1984 (MEL, NSW). **VICTORIA:** Grampians, Mt Dundas, c. 25 km NE of Cavendish, P.C. Jobson 3931, I.C. Clarke, J.E. Tonkin, & N.O. Wallace, 26.x.1995 (BRI, CANB, MEL); Mt Richmond National Park, far south east corner of Park (21 km north west of Portland), R.V. Smith 671122, 15.x.1967 (AD, CANB, HO, MEL, NSW); South-west. Framlingham Forest, ca. 20 km NE of Warrnambool, M.G. Corrick 7929, 18.xii.1981 (AD, CANB, MEL, NSW); Glenmaggie Flora Reserve, A.C. Beaglehole 78491, 19.x.1984 (MEL); Waratah Bay, young sand dunes at the mouth of shallow inlet, P.C. Heyligers 81015, 20.xi.1981 (CANB, MEL); 11.5 km NW of Foster on road to Meenyan, M.E. Lawrence 1093, 3.xii.1978 (AD). **TASMANIA:** Anthony Beach, Smithton, D.I. Morris 79146, 12.vii.1979 (HO); Small group of three islands off NW tip of Preservation Island, S. Harris, 28.xi.1986 (HO); Chalky Island off central W coast of Flinders Island, S. Harris, 10.xii.1986 (HO); Forsyth Island, Furneaux Group, J.S. Whinray & A. Piesse (CANB); Blackmans Lagoon, A. Moscal 4549, 27.xi.1983 (CANB, HO).

4c. *Senecio pinnatifolius* var. *capillifolius* (Hook.f.) I. Thoms., *comb. nov.*

S. capillifolius Hook.f., *Hooker's London J. Bot.* 6: 123 (1847); *S. laetus* var. *capillifolius* (Hook.f.) F. Muell., *Contributions to the Phytogeography of Tasmania* (1876), *nou. und., nom. inval.*

Type: Tasmania [V.D.L.], R.C. Gumm 705; *holo:* K. photo seen MEL.

Plants to c. 0.8 m tall, erect or sprawling, with tap-root moderately or well-developed. *Leaves* in mid-region of stems and major branches mostly 2–10 cm long, with marginal points 6–40 per side, bi- or tri-pinnatisect, slightly fleshy and succulent; base commonly narrow, sometimes attenuate; margin generally entire; divided leaves with 2–7 variously-shaped segments per side, with average position more or less central. *Uppermost leaves:* base sometimes slightly dilated, sometimes developing segments. *Inflorescences* of 3–15 capitula; bract-axils generally inconspicuously hairy, sometimes conspicuously; peduncle glabrous or transiently pubescent. *Capitulum:* calycular bracteoles 8–12, not imbricate at anthesis, narrow-ovate to lanceolate, 1.5–3.0 mm long, 0.7–1.2 mm wide, with margin $\pm$ glabrous or with weak hairs, pigmented purple apically, with patch c. 0.5 mm long; involucre 4.0–7.0 mm long, 3–6 mm diam., glabrous; phyllaries c. 13 or occasionally c. 20, with apex purple or hardly pigmented; sterome fleshy, often succulent, drying brown or blackish-brown; resin ducts moderately distinct, pale to orange; inner phyllaries: chevron not developed, margin 0.2–0.3 mm wide 1 mm below apex broadening to c.

0.3–0.4 mm wide proximally; outer phyllaries: margin c. 0.1 mm wide 1 mm below apex broadening to 0.2 mm wide proximally. *Ray florets* c. 13, equal to or fewer than phyllaries. *Achenes* 2.0–3.0 mm long, 30–40% of length of phyllaries, brown, with papillose hairs in broad bands; hairs of achenes of ray florets exceeding pappus-ring. (Fig. 12)

Distribution and Habitat: Occurs on islands of Bass Strait, notably the Furneaux and Kent group (Fig. 7e). Grows in often rocky environments on or near the coast.

Notes: This variety is characterised by succulent branches (generally quite flattened after pressing), congested corymbiform inflorescences that are held only a short distance above the often congested upper-branch leaves, ligules not or hardly longer than the involucre, and relatively short achenes. There are two distinct extremes of leaf forms but there are also numerous specimens of an intermediate nature. The type specimen has leaves with long, filiform primary and secondary segments, whereas another form has smaller intricately divided often tri-pinnatisect leaves with segments rather crowded (this latter form is shown in Fig. 12). This variety and var. *pinuatifolius* are the two varieties of *S. pinuatifolius* to develop capitula with c. 20 phyllaries. Forms of var. *laueolatus* with bi-pinnatisect leaves, some of which occur on Bass Strait Islands, resemble var. *capillifolius* but these forms have inner phyllaries with chevron markings, inflorescences and especially leaves are less congested and the ligules are longer than the involucre.

Selected specimens examined: TASMANIA: Sea Lion Island, Near S Western point, *J.S. Whinray* 8759 (MEL); Furneaux Group; Craggy Island, *J.S. Whinray* 311, 6.xi.1972 (HO); Great Dog Island, *M. Christie*, Dec. 1971 (HO, MEL); North East Island, Kent Group, *N.P. Brothers* s.n., 15.vii.1981 (HO); Round Islet, Hogan Group, *N.P. Brothers* 85, 15.xi.1983 (HO); Big Dog Island, Furneaux Group, *J.S. Whinray* 189, 6.ix.1972 (CANB); Boxen Island, Western slope of summit, *J.S. Whinray* 8723 (AD, CANB, HO, MEL); Spike Island, *S. Harris*, 26.xi.1986 (HO); Beagle Island, *S. Harris*, 28.xi.1986 (HO); North Middle Pasco Island, Pasco Group, off W coast of Flinders Island, *S. Harris*, 14.xii.1986 (HO); Little Chalky Island, *A.M. Buchanau* 11210, 14.xii.1988 (HO, MEL); Little Chalky Island, Furneaux Group, North Coast, *J.S. Whinray* 1465, 6.iii.1978 (CANB).

4f. *Seuocio pinuatifolius* var. *alpinus* (Ali) I.Thomps., *stat. et comb. nov.*

S. laetus subsp. *alpinus* Ali, *Austral. J. Bot.* 17: 167 (1969); J.H. Willis, *Haudb. Pl. Victoria* 2: 751 (1972); G.J. Harden, *Fl. New South Wales* 3: 308 (1992).

Type: Victoria, Mt Buffalo National Park, on SW margin of Lake Catani, c. 4500 ft, 21 Feb. 1963, *J.H. Willis*; holo: MEL.

Seuocio pinuatifolius A.Rich. var. *pleiocephalus* (Rodway) Belcher, *Muelleria* 9: 127 (1996), *nom. inval.*; N.G. Walsh, *Fl. Victoria* 4: 949 (1999). [Belcher (1996) made this new combination based on the erroneous idea that *S. pectinatus* var. *pleiocephalus* Rodway was validly published as a new variety. Bentham published this variety in 1867 based on *S. leptocarpus*. If treated as a new variety, i.e. as *S. pinuatifolius* var. *pleiocephalus* Belcher, it would also be invalid as no latin diagnosis was given.]

?*S. rupicola*, A.Rich., in J.S.C. Dumont d'Urville, *Voy. Astrolabe* 2: 119, t. 37 (1834). *Type:* Tasmania, 'Van Diemen's Land' A. Lessou 19, 1828; holo: P.

Plants to c. 1 m tall, erect or suberect, or ascending from a horizontal rhizome and then aerial branches absent or few, with tap-root poorly or moderately developed. *Leaves* in mid-region of stems and major branches 2–10 cm long, with marginal points 5–25 per side, often divided, occasionally not, subfleshy; base attenuate, without segments; margin denticulate or serrate; undivided leaves oblanceolate, rachis 2–8 mm wide; divided leaves with up to 6 oblong or elliptic segments per side, average position distal to mid leaf. *Uppermost leaves* commonly elliptic; base attenuate or cuneate, sometimes with basal segments. *Inflorescences* of 3–15 capitula; bract-axils hairy, with hairs short; peduncles with sparse to somewhat dense indumentum of short hairs. *Capitulum:* calycular bracteoles 6–12, not or mildly imbricate at anthesis, ovate to narrow-ovate, 1.5–3.0 mm



Figure 12. *S. pinnatifolius* var. *capillifolius* (J.S. Whinray 8806 MEL)

long, 0.6–1.2 mm wide, margin commonly $\pm$ densely haired, pigmented dark purple black apically, with mark c. 0.5–1 mm long; involucre 3.5–6.0 mm long, 3–4 mm diam.; phyllaries mostly c. 13, with apex brown or black; stereome slightly fleshy, sometimes slightly pubescent; resin ducts well-developed, orange; inner phyllaries: chevron absent or rarely obscure; margin 0.2–0.3 mm wide 1 mm below apex broadening to 0.3–0.4 mm wide proximally; outer phyllaries: margin c. 0.1 mm wide 1 mm below apex broadening to c. 0.2 mm wide proximally. *Ray florets* mostly c. 13. *Acheues* 2.5–3.5 mm long, generally c. 50–75% of length of phyllaries, with papillose hairs in narrow bands, or achenes glabrous; hairs of achenes of ray florets not exceeding pappus-ring. (Fig. 13)

Distribution and Habitat: Occurs in south-eastern Australia. On the mainland it extends from the Brindabella Ranges in south-eastern New South Wales south to the Kosciuszko region in far south-eastern New South Wales, and south-east to the highlands of eastern Victoria. In Tasmania it occurs in the north-central region and further south-east on Mt Wellington (Fig. 7f). Grows at moderate to high altitudes in forest, woodland and alpine meadows.

Notes: Var. *alpinus* is largely separated geographically and altitudinally from other varieties. It has oblanceolate leaves with relatively distally positioned marginal points or segments; however smaller-leaved forms are sometimes difficult to distinguish from var. *pinnatifolius*. Var. *alpinus* is generally also recognisable by the pubescence on both the peduncle and bracteole margins.

Selected specimens examined: **NEW SOUTH WALES**: Kanangra-Boyd National Park near Boyd River Camping Ground, K. McDougall 708 & M. Gray, 2.xii.1999 (CANB); Brindabella Range, Mt Ginini, S.R. Corbett, 8, 11.xii.1980 (CANB); Cotter River District, Summit plateau area of Mt Gingera, Bimberi Range, R. Schodde 1246, 10.i.1961 (AD, CANB, NSW); Cascade trail, nr Dead Horse Gap, Snowy Mtns, J.I. Raine ANU10356, 27.ii.1971 (CANB); Near Cabramurra, C.W.E. Moore, 20.xii.1963 (CANB); Southern Tablelands, Mt Kosciuszko National Park, opposite Blue Lake along main track from Charlotte Pass to Mt Kosciuszko via Club lake, P.S. Short 4000, K. Watanabe, T. Yahara, T. Denda & Y. Suzuki, 5.ii.1993 (AD, CANB, MEL, NSW); Kosciuszko National Park, Below Seamans Hut toward Snowy River Bridge, B. Barnsley 1292, J. Rymer & R. Jackson, 19.ii.1980 (CANB, HO); Kosciuszko National Park, Gurrangorambla Range, Mount Morgan, summit ridge, J. Pena I & K. Er, 12.i.1994 (CANB, MEL, NSW, PERTH); Clarke Gorge, Cave Creek, Coolamon Caves area, 44 km NNE of Kiandra, P.C. Jobson 4613, R.G. Coveny & P.G. Kodala, 26.i.1997 (MEL, NSW). **VICTORIA**: Cope Hut, Bogong High Plains, MUMC, 31.xii.1964 (CANB); Bentley's Plain: 30.6 km from Ensay toward Tongio, E.M. Canning 1491, 5.i.1969 (CANB); Bogong High Plains. Near Wilkinson Lodge, T.B. Muir 2810, 27.ii.1963 (MEL); Along roadside, 4.5 km (by road) SE of General Store at Hotham Heights, D.E. Albrecht 220 & B.J. Conn, 23.ii.1984 (AD, MEL); Bogong High Plains, 1.7 km NW of Marm Point, on verge of Big River Fire Track, R.J. Adair 1628, 20.ii.1982 (MEL); Benambra-Wulgulmerang Road, Native Dog Plain, Buchan River Area, $\pm$ 19.2 m [30.8 km] by road from Snowy River Road, A.C. Beanglehole 33316, K.C. Rogers & E.W. Finck, 7.i.1970 (MEL); 4.2 km SE of Falls Creek PO, c. 300 m SW of quarry, R.E. Miller 3, 7.ii.1996 (MEL). **TASMANIA**: Ben Lomond National Park, along cross-country track east of ski village, R.J. Bayer TAS-00010, D. Les, G. Chandler, L. Ainouche & A. Baumel, 17.i.2000 (CANB, HO); Mt Field National Park, c. 11 km from National Park township along road to Lake Dobson, P.S. Short 1846, 25.i.1983 (CANB, MEL); Hatfield river Crossing, c. 27 ml [45 km] from Rosebery toward Wynyard, E.M. Canning, 28.i.1969 (CANB); Mt Field National Park, E. Ganba, 5.iii.1951 (CANB); Quamby Bluff (mid NE slope) 2 km SW of Golden Valley, A. Moscal 12568, 6.iii.1986 (HO, MEL).

4g. *Senecio pinnatifolius* var. *maritimus* (Ali) I.Thomps., stat. et comb. nov.

S. laetus subsp. *maritimus* Ali, *Austral. J. Bot.* 17: 171 (1969), *pro parte* incl. type.

Type: South Australia, D'Estrees Bay [Kangaroo Island], R. Tate s.n., c. 1880; holo: AD [Ali's citation mistakenly places D'Estrees Bay on the west coast of South Australia south of Ceduna].



Figure 13. *S. pinnatifolius* var. *alpinus* (L. Haegi 1632 MEL).

S. pinnatifolius var. 2 *sensu* N.G. Walsh, *Fl. Victoria* 4: 948 (1999), *pro parte minore* [noted as extreme variants from south-western Victoria].

Plants to c. 0.4 m tall, sprawling to prostrate, with tap-root poorly or moderately developed. *Leaves* in mid-region of stems and major branches, 0.4–5 cm long, with marginal points 0–8 per side, divided or not; base attenuate to cuneate, without segments; margin entire or denticulate; fleshy and succulent, drying wrinkled; undivided leaves obovate to oblanceolate, spatulate or oblong to narrow-linear, with rachis 1–8 mm wide; divided leaves with 1–3 oblong to narrow-oblong segments per side, with average position c. midleaf. *Uppermost leaves*: base narrow or slightly to strongly dilated, with rounded auricles slightly stem-clasping. *Inflorescences* of 1–7 capitula; bract-axils variously hairy; peduncles glabrous. *Capitulum*: calycular bracteoles 6–10, usually not imbricate at anthesis, narrow-ovate, 1.5–2.5 mm long, 0.8–1.5 mm wide, with margin glabrous, or hairy, pigmented light or dark purple apically, with mark c. 0.5 mm long, or unpigmented; involucre 4.0–7.0 mm long, 3–6 mm diam.; phyllaries mostly c. 13, with apex brown, purple or unpigmented; stereome fleshy and succulent; resin ducts indistinct or not, pale; inner phyllaries: chevron absent, or occasionally weakly developed; margin 0.2–0.3 mm wide 1 mm below apex, broadening, to 0.4–0.8 mm wide proximally; outer phyllaries: margin c. 0.1 mm wide 1 mm below apex, broadening to c. 0.2–0.4 mm wide proximally. *Ray florets* c. 13. *Achenes* 2.0–3.0 mm long, generally c. 40–50% of length of phyllaries, olive-brown, brown or golden, with papillose hairs in broad bands; achenes of ray florets commonly pale orange-tan or reddish (on mainland); hairs of achenes of ray florets mostly exceeding pappus-ring. (Fig. 14)

Distribution and Habitat: Occurs on the coast of southern Australia from Cape Otway in western Victoria west to south-western Western Australia, and in western Tasmania (Fig. 7g). Although records from central South Australia westwards are few, this variety is probably quite widespread in these regions. Grows on rocky cliffs, in rocky crevices and in sand dunes, and is commonly associated with limestone.

Notes: This variety can be difficult to distinguish from coastal forms of var. *lanceolatus* and var. *pinnatifolius*, and from *S. spanomerus* q.v. Var. *maritimus* intergrades and/or hybridises with *Senecio spanomerus* along the South Australian coast. Similarities in leaf and achenial morphology suggest a close relationship between these taxa.

In the Tasmanian form of var. *maritimus*, the uppermost leaves are more dilated basally, the calycular bracteoles are smaller and the achenes are differently coloured (achenes of ray florets olive-brown rather than reddish, achenes of disc florets golden rather than brown) compared to the mainland form. The Tasmanian form can be difficult to distinguish from *S. spathulatus* var. *spathulatus* which occupies similar coastal habitats (see notes under the latter).

Var. *maritimus* differs from the coastal form of var. *pinnatifolius* that is widespread along the east coast of Australia including Tasmania (and previously identified as *S. lantus* subsp. *maritimus*) by having fleshier leaves, generally fewer leaf segments (if present) and with a lower length:width ratio, shorter achenes relative to the length of the phyllaries, and the rachis of upper-branch leaves broader near the base and never developing strap-like basal segments (examples presented in Fig. 1d).

Selected specimens examined: **WESTERN AUSTRALIA**: Cape le Grande, T.B. Muir 4283, 7.x.1966 (MEL); On frontal dunes at Thistle Cove beach, I. Solomon 302, 12.x.1989 (PERTH); Shire of Oldfield, coastal sand dunes, ca. 14 km east of the mouth of Oldfield River, A.E. Orchard 1477, 12.x.1969 (AD, PERTH); Channel Rocks 18 km from Yallingup, N.C. Ollerenshaw NCO162 & N. Carriage, 10.x.1975 (CANB); Dyers Is., off S coast Rottnest Island, J.W. Green 521, 20.ix.1956 (PERTH). **SOUTH AUSTRALIA**: c. 15 km south-east of Cape Banks – ca. 35 km south of Mt. Gambier, J.B. Cleland s.n., 26.ii.1945 (AD); Cape du Couedie Lighthouse, E.N.S. Jackson 4379, 22.viii.1982 (AD, MEL); Kangaroo Island, Pennington Bay, D. Symon 14292, 12.i.1987 (AD). **VICTORIA**: Cape Grant, A.C. Beaglehole s.n. (MEL); Cape Bridgewater Car

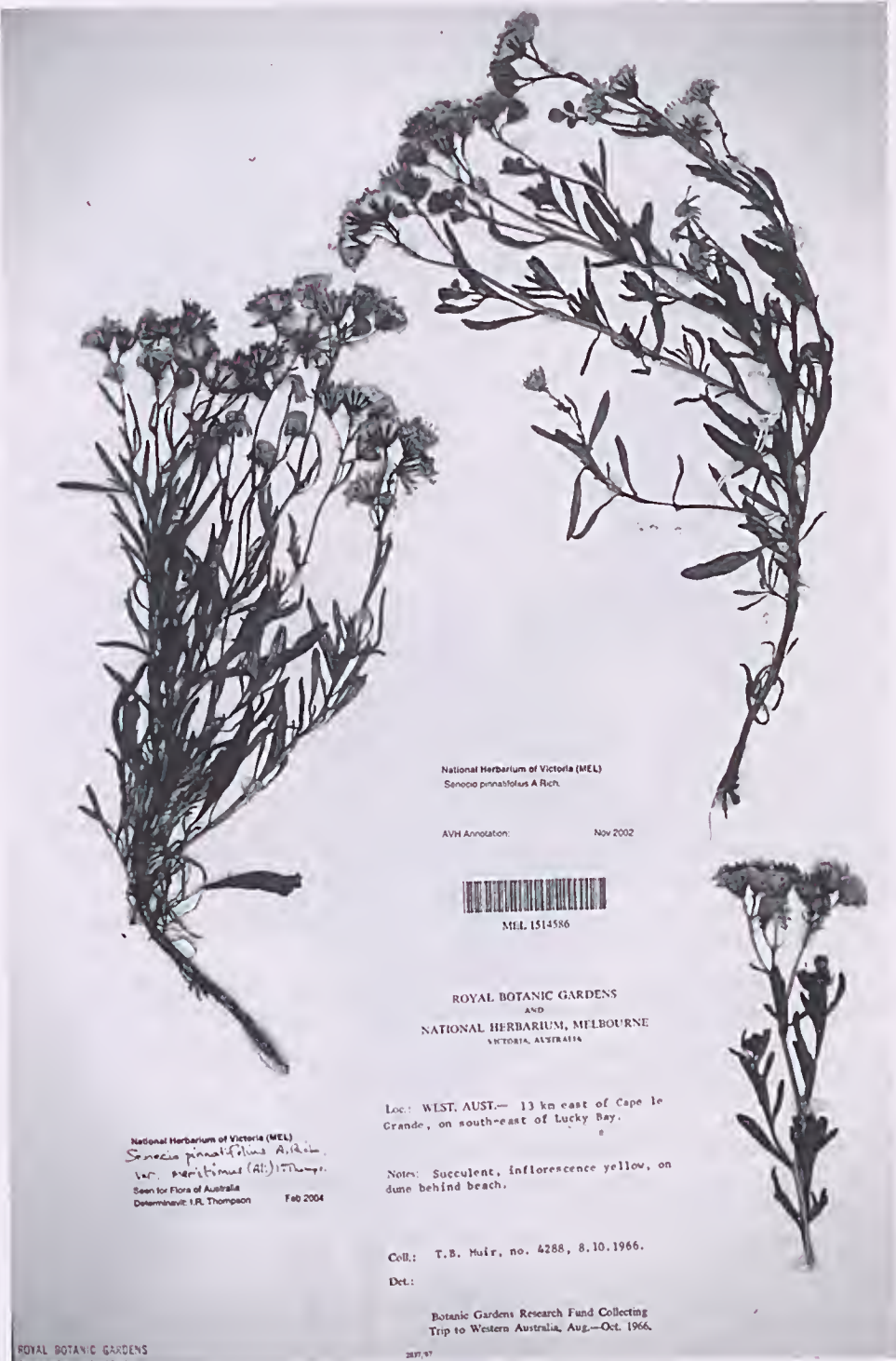


Figure 14. *S. pinnatifolius* var. *maritimus* (T.B. Muir 4288 MEL).

Park, 25 km W of Portland, *P.C. Jobson* 2096, 13.iv.1993 (MEL); Cape Nelson, *A.C. Beanglehole s.n.*, Oct. 1962 (MEL); Cape Duquesne (Petrified forest area), *I.R. Thompson* 734 & *J. Stubbings*, 1.i.2002 (AD, MEL); Cape Nelson, on cliff ledge by lighthouse, *M.E. Phillips* 462, 27.x.1963 (CANB). TASMANIA: 2 km NW of Nye Bay, *A.M. Buchanan* 7902, 16.i.1986 (HO); Pegg Creek, Hartwell Cove, *A. Moscal* 10008, 7.iii.1985 (AD, HO); Near mouth of Flat Creek, *A.M. Buchanan* 5782, 22.ii.1985 (AD, HO); Cypress Creek, *A. Moscal* 9722, 21.ii.1985 (HO); 5 km south of Endeavour Bay, *A. Moscal* 6008, 30.i.1984 (AD, HO, MEL); Suicide Bay, Woolnorth Station, *A.C. Rozefelds* 1382, 19.i.1999 (HO); Rupert Point, *W.D. Jackson* 345, Jan. 1954 (HO).

4h. *Senecio pinnatifolius* A.Rich. var. *leucocarpus* I.Thomps., var. *nov.*

A varietate typica foliis carnulosioribus, acheniis longioribus, indumento acheniorum densiore differt.

Type: Western Australia, Dempster Inlet, Middle Mount Barren, *C.A. Gardner* 9194, 21 Sept. 1948; *holo:* PERTH; *iso:* PERTH

Plants to 0.2 m tall, sprawling or prostrate; roots not known. *Leaves* in mid-region of stems and major branches 1.0–2.0 cm long, with marginal points 0–2 per side, divided or not, fleshy, drying somewhat wrinkled; base cuneate to attenuate, without segments; margin entire; undivided leaves oblanceolate to narrow-elliptic, with rachis 2–3 mm wide; divided leaves with 1 narrow-oblong segment per side, with average position slightly proximal. *Uppermost leaves* sometimes narrow-oblong; base $\pm$ truncate, sometimes minutely auriculate. *Inflorescences* of 1–5 capitula; bract-axils: hairs short and inconspicuous; peduncles glabrous. *Capitula:* calycular bracteoles 8–10, slightly imbricate at anthesis, ovate to narrow-ovate, 2.0–3.0 mm long, 0.8–1.5 mm wide, with margin $\pm$ glabrous, pigmented dark purple apically, with mark c. 0.5 mm long; involucre 5.0–6.0 mm long, c. 4 mm diam.; phyllaries mostly c. 13, with apex dark purple; stereome fleshy, succulent; resin ducts indistinct; inner phyllaries: chevron absent; margin 0.2–0.3 mm wide 1 mm below apex, broadening to c. 0.6 mm wide proximally; outer phyllaries: margin vestigial 1 mm below apex, broadening to c. 0.2 mm wide proximally. *Ray florets* c. 13. *Achenes* 4.0–4.5 mm long, generally c. 70% of length of phyllaries, appearing white, with papillose hairs obscuring the entire surface; hairs of achenes of ray florets exceeding pappus-ring. (Fig. 15)

Etymology: The varietal epithet refers to the colour of the densely hairy achenes (Gk. *leucos*, white, and *carpos*, fruit).

Distribution and Habitat: Known only from the type locality at Dempster Inlet, east of Esperance (Fig. 7h). There is no locality information but it appears to be a coastal plant.

Notes: This variety is readily recognised by a combination of small, crowded fleshy leaves and long, densely hairy achenes.

5. *Senecio spanomerus* I.Thomps., sp. nov.

A *S. pinnatifolius* A.Rich. nodis foliorum paucioribus proximalibus, bractcolis lanceolatis, acheniis modice dimorphis differt; a *S. lacustrino* I.Thomps. plantis perennis, capitulis brevioribus, phyllariis plerumque pluribus, bracteolis majoribus, acheniis brevioribus differt.

Type: South Australia, c. 7 km [4 miles] east of Kiki, *R.L. Specht*, Aug. 1961; *holo:* MEL; *iso:* MEL.

S. laetus subsp. *dissectifolius* Ali, *Austral. J. Bot.* 17: 168 (1969), *pro parte* incl. type; J.H. Willis, *Handb. Pl. Victoria* 2: 751 (1972), *pro parte*. *Type:* Victoria, Wyperfeld National Park, NW Mallee, J.H. Willis, 16 July 1961; *holo:* MEL.

S. pinnatifolius var. 1 *sensu* N.G. Walsh, *Fl. Victoria* 4: 948 (1999).



Figure 15. *S. pinnatifolius* var. *leucocarpus* (holo: C.A. Gardner 9194 PERTH).



Figure 16. Distribution of a. *Senecio pinnatifolius*; b. *S. spanomerus*; c. *S. brigalowensis*; d. *S. depressicola*; e. *S. eremicola*; f. *S. lacustrinus*; g. *S. hamersleyensis*; h. *S. condyus*.

Perennial to c. 1.0 m tall, usually erect, nearly glabrous or with scattered long hairs. *Taproot* well-developed, often becoming stout and woody; secondary roots fine. *Leaves* in mid-region of stems or major branches mostly 2–10 cm long, with marginal points 0–4(–6) per side, usually divided, subfleshy to fleshy, succulent on coast, sometimes with scattered hairs; base very narrow; margin entire, or rarely with a few denticulations; undivided leaves linear to narrow-linear; divided leaves with 1 or 2 (or occasionally 3) narrow-oblong to narrow-linear segments per side, with average position central or proximal to mid leaf, with rachis to 2 mm wide. *Uppermost leaves* sometimes dilated basally and developing segments from this dilated region, average position of segments usually proximal. *Inflorescences* of 3–20 capitula; bract-axils commonly conspicuously hairy. *Capitula*: calycular bracteoles 8–12, lanceolate, mostly 1.5–3.5 mm long, 0.5–1.0 mm wide, with margin often bearing coarse white hairs; apex acute to peracute, pigmented black or brown in zone c. 0.5–1 mm long; involucre 4.0–6.0 mm long, 3–4 mm diam.; phyllaries c. 13 in all or most capitula or c. 20 in all or most capitula, with apex usually strongly pigmented brown or black; stereome slightly fleshy, often drying bronze; resin ducts well-developed, commonly orange on drying; inner phyllaries: broader stereomes 0.5–1.0 mm wide; margin 0.1–0.2 mm wide 1 mm below apex, similar in width or broadening to 0.2–0.3 mm wide proximally; outer phyllaries: margin vestigial 1 mm below apex remaining vestigial or broadening to c. 0.1 mm wide proximally. *Florets* 40–60; ligulate florets 8–13, often fewer than phyllaries, with ligule 6–12 mm long; corolla of disc florets 4–6 mm long. *Achenes* 1.8–2.8 mm long, 40–50% of length of phyllaries, with indumentum and attachment points on receptacle usually slightly dimorphic; achenes of disc florets brown, with ribs not or hardly convex; papillose hairs in broad bands covering 50–90% of surface, with l:w ratio c. 5, typically slightly exceeding pappus-ring; achenes of ray florets reddish, with papillose hairs slightly longer, covering all or most of surface, exceeding pappus-ring. *Pappus* 4–5 mm long. (Fig. 17)

Flowers mostly late winter and spring.

Etymology: The epithet alludes to its relatively simple leaf, i.e. with few or no marginal points or pinnate segments (Gk. *spanos*, few; *meros*, parts).

Distribution and Habitat: Occurs predominantly in south-eastern Australia, extending from south-western South Australia east through south-eastern South Australia to the Weddin Mountains in south-central New South Wales and to Bendigo in north-central Victoria. A possible outlier has been recorded from near Mt Buraminy north-east of Esperance in southern Western Australia. (Fig. 16b). Grows predominantly in semi-arid environments in sandy and loamy soils in lowland plains and sandhills, including coastal dunes.

Notes: *Senecio spanomerns* can be distinguished from most varieties of *S. pinnatifolius* using a combination of the following characters. Most of these are presented above in the key to species and include: the shape, pigmentation, texture, and indumentum of the calycular bracteoles, the number and positioning of leaf-segments, the lack of development of straplike basal segments from a narrow base, the lack of marginal points, phyllary number and the narrower hyaline margin of phyllaries, and the relatively short achenes with hairs overtopping the pappus-ring. Forms of *S. pinnatifolius* var. *pinnatifolius* occurring on the tablelands of New South Wales and southern Queensland and also in south-western Western Australia are particularly close to *S. spanomerns* but they have finer leaf rachides and segments, their leaves often have straplike basal segments arising from a narrow base, their capitula and calycular bracteoles are generally smaller, and the bracteoles are often purple-tipped.

Along the coast of South Australia the distributions of *S. spanomerns* and *S. pinnatifolius* var. *maritimus* tend to overlap, and these two taxa may be difficult to distinguish, especially because of the stunting effect of the coastal environment. *S. spanomerns* is an erect plant with less fleshy leaves. Its leaf rachides and segments have



Figure 17. *S. spanomerus* (holo: R.L. Specht MEL).

a higher length:width ratio and do not develop marginal points in the distal third. It generally has more capitula per inflorescence, and phyllaries with a narrower hyaline margin. Hybrids between these two taxa are also likely to occur.

Senecio spanouerus is also similar to *S. lacustrinus* which replaces it in more arid regions to the north and west. Differences between these species are discussed under the latter.

Selected specimens examined: **WESTERN AUSTRALIA:** Roe botanical district, 10.5 km NE of Mt Buraminy, W.R. Archer 27069211, 27.vi.1992 (MEL); 19.5 km SE Mundrabilla Hotel, B. Downing 993, 1.x.1984 (CANB, PERTH); Frazer range, 79 miles [130 km] E of Norseman, M.E. Phillips, 3.ix.1968; 1 km from Point Malcolm homestead, west of Israelite Bay, E.C. Nelson ANU16529, 15.ix.1972 (CANB); Eyre Bird Observatory, Nuytsland Nature Reserve, T.R. Lally 377, 25.ix.1994 (CANB, HO, PERTH). **SOUTH AUSTRALIA:** Eastern side of Murray Road from Murray Bridge to Mannum on corner of road to Bow Hill, D.J.E. Whibley 8683, 1.xi.1983 (AD, MEL); 39 mls [62 km] east of Kyancutta, Eyre Highway, R.V. Smith s.n., 10.ix.1964 (MEL); Dark Island Heath, Keith, plot 6, R.L. Specht, Aug. 1961 (MEL); 5 miles [8 km] west Murray Bridge, R. Filson 3018, 4.viii.1960 (MEL); Yorke peninsula. Pine Point – c. 18 km S of Ardrossan, c. 23 m behind main primary dune at top of beach, R.V. Smith 89/11, 13.ix.1989 (AD, CANB, MEL); Lake Frome, R.J. Bates 75099, 5.xi.1993 (AD, MEL); Innestown, Innes National Park, Yorke Peninsula, M.E. Lawrence 501, 9.viii.1976 (MEL). **NEW SOUTH WALES:** c. 50 km E of Forbes, Eugowra–Cudal Rd, W of Cudal just before Murga Sawmill, R. Cousens s.n., Sept. 1992 (CANB, NSW); 30 km west of Euston, W.E. Mulham 1348, 6.x.1978 (CANB). **VICTORIA:** S end of Hattah-Kulkyne National Park, Bulldozed firebreak 200 m E of Calder Highway, 100 m S of roadside stop. Roadside stop is 27.3 km N of Ouyen, K. McFarlane 126, 22.viii.1996 (MEL); Glenlee Flora and Fauna Reserve, A.C. Beaglehole 84321, 13.ix.1986 (AD, MEL); Little Desert National Park, central block. Broughton's Waterhole, 23 km SSE of Kaniwa, I.C. Clarke 2318, 20.x.1993 (CANB, MEL); Kamarooka State Forest, 2.3 km along East Kamarooka Road from Elmore–Raywood Road, P.G. Neish 441, 3.x.1997 (MEL).

6. *Senecio brigalowensis* I.Thomps., *sp. nov.*

A *S. pinnatifolius* A.Rich. plantis semper annuis, phyllariis plerumque pluribus, phyllariis quam ligulis pluribus differt; a *S. eremicola* I.Thomps. capitulis et acheniis brevioribus, pilis acheniorum brevioribus differt.

Type: Queensland. 3 miles [5 km] N of “Mooramin” Stn, L.G. Adams 1267, 12 Aug. 1964; *holo:* BRI; *iso:* CANB.

Annual to c. 0.5 m tall, erect, $\pm$ glabrous. *Taproot* well-developed; secondary roots tapering. *Leaves* in mid-region of stems or major branches mostly 3–12 cm long, with marginal points 5–20 per side, mostly divided, occasionally not, thin on drying; base attenuate or becoming dilated; margin with occasional teeth or denticulations; undivided leaves oblanceolate to narrow-elliptic; divided leaves with 2 or 3 narrow-triangular or narrow-oblong to linear segments per side, with average position central. *Uppermost leaves:* segments positioned proximally; base becoming more dilated with often long segments. *Inflorescences* sometimes congested, of 3–15 capitula; axils of bracts inconspicuously hairy. *Capitula:* calycular bracteoles 6–8, not imbricate at anthesis, narrow-ovate to lanceolate, 1.0–2.0 mm long, 0.5–0.8 mm wide, largely scarious, with margin often with scattered long hairs; apex peracute, pigmented dark brown in zone 0.3–0.5 mm long; involucre 4.0–5.0 mm long, 2.5–4 mm diam.; phyllaries c. 18–20 in all or most capitula, with apex pigmented light brown, or hardly pigmented; stercome thin to slightly fleshy, drying yellow-green or brown (base of capitulum contrastingly drying dark bronze-brown); resin ducts moderately developed, orange; inner phyllaries: broader stercomes 0.5–0.8 mm wide; margin c. 0.2 mm wide 1 mm below apex, similar in width proximally; outer phyllaries: margin vestigial to c. 0.1 mm wide throughout. *Florets* 40–60; ligulate florets mostly c. 13, fewer than phyllaries, with ligule 6–8 mm long; corolla of disc florets 4–5 mm long. *Achenes* homomorphic, 2.0–3.0 mm long, generally

c. 50% of length of phyllaries, golden, brown, olive-brown or green, with ribs not or hardly convex, papillose hairs in bands obscuring c. 50% of surface, $\pm$ appressed, with l:w ratio c. 3; hairs of achenes of ray florets not or hardly exceeding pappus-ring, *Pappus* c. 4 mm long. (Fig. 18)

Flowers most times of the year.

Etymology: The epithet alludes to the distribution of this species in Brigalow (*Acacia liarpophylla*) country in Queensland

Distribution and Habitat: Occurs in southern and central Queensland from Castle Rock north-west of Quilpie in the south-west east to Nanango in the south-east and north-east to near Mackay in the central-east (Fig. 16c).

Notes: *Senecio brigalowensis* is an annual with leaves pressing thin, with narrow to broad leaf-segments, with short capitula with many phyllaries, and the achenes with short and appressed papillose hairs. A form of *S. pinnatifolius* var. *pinnatifolius* that occurs further to the east and south than *S. brigalowensis* has similar capitula; however, it is commonly perennial, the leaf rachides and segments are all filamentous, the peduncle is longer, the phyllaries are more herbaceous (drying green or olive rather than yellow-green), the resin ducts more pronounced, the margin of the outer phyllaries are distinctly broader, and the bracteoles are often purple-tipped. The annual species *S. tuberculatus* Ali, although not lautusoid, is superficially similar to and is sympatric with *S. brigalowensis*, but the former is distinguished by the coarse hairs on the phyllaries and the much coarser pappus bristles, as well as by the greater length and narrowly lageniform shape of the achenes.

Selected specimens examined: QUEENSLAND: Glenmoral Gap, E foot of Dawson Range, Sawmill Road, 1 km off road to Brigalow Research Station, *I.R. Telford* 11927, 9.xi.1993 (BRI, CANB, NSW); SW of Rockhampton, c. 6 km NNW of Biloela, c. 400 m on side road from Callide Valley Railway Line through to Burnett Highway, *I. Radford s.n.*, 16.ix.1993 (BRI, CANB, MEL, NSW, PERTH); Warren Point Station, Mitchell, *P.N. Martensz.*, 24.viii.1968 (CANB); 30 km N of Tambo, *R. Duthie* 401, 14.vii.1992 (CANB); 64.5 km N of Injune, just N of Wallaroo Station turnoff, *D.L. Jones* 6277 & *B.E. Jones*, 25.viii.1990 (CANB).

7. *Senecio depressicola* I.Thomps., *sp. nov.*

A *S. pinnatifolius* A.Rich. plantis semper annuis, phyllariis quam ligulis plerumque pluribus, ligulis brevioribus differt; a *S. eremicola* I.Thomps. capitulis pluribus minoribus, phyllariis vulgo paucioribus, acheniis brevioribus differt.

Type: South Australia, Goyder Lagoon, 25 km NNE of Clifton Hills Homestead, *F.J. Badman* 1362, 18 July 1984; holo: CANB; iso: AD, MEL.

Annual to c. 0.5 m tall, erect, $\pm$ glabrous. *Taproot* well-developed; secondary roots tapering. *Leaves* in mid-region of stems or major branches mostly 3–12 cm long, with marginal points 10–30 per side, mostly divided, occasionally not, thin on drying; base attenuate or becoming dilated; margin with frequent teeth or denticulations; undivided leaves narrow-linear; divided leaves with 3–5 narrow-triangular or narrow-oblong to linear segments per side, with average position central, sometimes again divided. *Uppermost leaves*: segments occurring more proximally; base becoming more dilated with often long segments. *Inflorescences* of (3–)8–20 capitula. *Capitula*: calyicular bracteoles 4–8, not imbricate at anthesis, narrow-ovate to lanceolate, 1.0–2.0 mm long, 0.3–0.7 mm wide, largely searious, margin subentire, nearly glabrous; apex peracute to filamentous, pigmented dark brown in zone 0.3–0.5 mm long; involucre 3.0–5.0 mm long, 2.5–4 mm wide; phyllaries often c. 13, occasionally a higher percentage c. 18–20, with apex pigmented light or dark brown or hardly marked; stercome thin, drying yellow-green (receptacle drying dark bronze-brown); resin ducts indistinct to moderately developed,



Figure 18. *S. brigalowensis* (holo: L.G. Adams 1267 CANB).

pale or orange; inner phyllaries: broader stercomes 0.7–1.2 mm wide; margin c. 0.25 mm wide 1 mm below apex similar in width proximally; outer phyllaries: margin vestigial to c. 0.1 mm wide throughout. *Florets* 40–60; ligulate florets often c. 8, sometimes 13, fewer than phyllaries, with ligule 4–7 mm long; corolla of disc florets 3–5 mm long. *Achenes* slightly dimorphic; disc achenes 1.6–2.5 mm long, generally c. 40–50% of length of phyllaries, olive-brown or dark brown, with ribs not or hardly convex, papillose hairs in bands obscuring most or all of surface, $\pm$ appressed, with l:w ratio c. 5, equal with or exceeding pappus-ring; achenes of ray florets often reddish, usually appearing white due to coarse hairs, with hairs clearly exceeding pappus-ring. *Pappus* 2–4 mm long. (Fig. 19)

Flowers mostly late autumn–spring.

Etymology: The epithet alludes to the centre of distribution of this species in the Lake Eyre basin to the north-east of Lake Eyre (*L. depressus*, a depression, and *cola*, dwelling in).

Distribution and Habitat: Occurs in far north-eastern South Australia, south-western Queensland and in central-eastern Northern Territory (Fig. 16d). Grows in sands and grey clays, beside swamps and billabongs, and on flood plains of eastern central Australia, particularly those in the Lake Eyre basin north-east of Lake Eyre.

Notes: Similar to other lautusoid species of central Australia but characterised by its more numerous small capitula with short ligules, achenes and pappus. Robust specimens develop large pinnatisect to bipinnatisect leaves with numerous marginal points.

Selected specimens examined: **NORTHERN TERRITORY**: 171/2 m. [29 km] SW of Brunette Downs, *G. Chippendale*, 18.vi.1960 (BRI, CANB, DNA, MEL); 17 miles [28 km] WNW of Rankine River Police Station, *R.A. Perry* 1551, 18.vi.1948 (BRI, CANB); Shady Camp Stockyard, Burramurra, *B.G. Thomson* 426, 18.viii.1983 (DNA). **SOUTH AUSTRALIA**: Cadelga Outstation, Cordillo Downs station, *F.J. Badman* 9768, 11.x.1996 (AD); Goyder's Lagoon, *R.L. Crocker*, 16.vii.1939 (AD); 10 km W of Gidgealpa Homestead. Site 21, *N.P. & W.S. Survey & Research* 1104, 23.ix.1983 (AD); Cooroomunchera WH [Waterhole], Cooper Creek, *F.J. Badman* 1290, 18.vi.1984 (AD, MEL); Lake Etamunbanie, Pandie Pandie Station, *F.J. Badman* 4962, 21.viii.1991 (AD); Innamineka Regional Reserve; track to Coongie Lakes, c. 54 km from Innamineka-Cordillo Road, *R.W. Purdie* 4530, 30.vii.1997 (CANB). **QUEENSLAND**: Diamantina River, 11/2 miles [2.5 km] west of Roseberth Homestead, *R. Filson* 3350, 1.x.1960 (MEL); Ca. 21/2 km south-west of Nappa-Merrie Station, *R.H. Kuchel* 2573, 18.viii.1968 (AD, MEL); Birdsville, D.E. Boyland 180, 20.ix.1966 (BRI, MEL); 78 km SW of Boulia, *R. Duthie* 417, 16.vii.1992 (CANB); Near South Australian border between Innamineka and Nappa Merrie, *D.J.E. Whibley* 2391, 19.viii.1968 (AD); Mt Howitt Station, *S.T. Blake* 11958, 5.vii.1936 (AD, BRI); Near Carandotta Homestead, 50 km S of Urandangie, *V.J. Neldner* 1493, Oct. 1984 (BRI); Floodplains of Diamantina River, 4 km SW of "Davenport Downs, *R.W. Purdie* 1180, 16.ix.1977 (BRI).

8. *Senecio eremicola* I.Thomps., *sp. nov.*

A. S. pinnatifolio A.Rich. plantis semper annuis, phyllariis plerumque pluribus, phyllariis quam ligulis pluribus, acheniis dimorphis differt.

Type: Northern Territory, 5 km west of Ross River Homestead, *A.S. Mitchell* 438, 12 Sept. 1978; holo: DNA; iso: CANB.

Annual to c. 0.8 m tall, erect. *Taproot* well-developed; secondary roots tapering. *Leaves* in mid-region of stems or major branches mostly 3–12 cm long, with marginal points 5–30 per side, mostly lacely divided, occasionally not, thin on drying; base becoming dilated above midstem; margin usually dentate or denticulate; undivided leaves narrow-elliptic or oblanceolate; divided leaves with 3–5 lobes or narrow-triangular or narrow-oblong segments per side, rachis to 7 mm wide, with average position central, sometimes again lobed. *Uppermost leaves*: segments more proximal, with rachides much narrower; base becoming more dilated, truncate or slightly stem-clasping. *Inflorescences* of 2–12 capitula. *Capitula*: calycular bracteoles 6–12, not imbricate at anthesis, lanceolate to narrow-lanceolate, 1.5–3.0



Figure 19. *S. depressicola* (holo: F.J. Badman 1362 CANB).

mm long, 0.4–1.0 mm wide, largely scarious, with margin nearly glabrous or with some weak hairs; apex peracute to filamentous, pigmented light brown in zone c. 0.3 mm long or scarcely pigmented; involucre 5.0–7.0 mm long, 4–6 mm diam.; phyllaries c. 20 in all or most capitula, with apex pigmented light brown or scarcely pigmented; stereome generally thin, drying yellow-green or yellow-brown; resin ducts moderately developed, pale or orange on drying; inner phyllaries: broader steromes 0.5–1.2 mm wide; margin c. 0.3 mm wide 1 mm below apex, similar in width proximally; outer phyllaries: margin vestigial to c. 0.1 mm wide throughout. *Florets* 50–80; ligulate florets often c. 13, fewer than phyllaries, with ligule 8–14 mm long; corolla of disc florets 5–7 mm long. *Achenes* somewhat dimorphic; disc achenes 3.0–4.5 mm long, generally c. 60% of length of phyllaries, golden, or brown, olive-brown or green, with ribs not or scarcely convex; papillose hairs in bands obscuring c. 50–70% of surface, appressed or slightly divergent, with l:w ratio c. 7–10, slightly exceeding pappus-ring; achenes of ray florets commonly 3.5–5.0 mm long, dark-red, with hairs slightly longer and clearly exceeding pappus-ring; carpodium larger; attachment points for achenes on margin of receptacle enlarged. *Pappus* c. 5–6 mm long. (Fig. 20)

Flowers mostly winter to early spring.

Etymology: The epithet alludes to the desert environment in which the species is found (Gk. *eremia*, desert; and *cola*, dwelling).

Distribution and Habitat: Occurs in central Australia from Harts Range in southern Northern Territory south to Mt Illbillie in northern South Australia and disjunctly further west at Giles Rock in far eastern Western Australia (Fig. 16e). Grows in stream beds and beside waterholes in sandy and gravelly soils

Notes: *Senecio eremicola* is characterised by a combination of large laccrately dissected leaves, a high number of phyllaries per capitulum, and long achenes with mild dimorphism. It is similar to *S. depressicola* in leaf morphology, and similar to *S. lacustrinus* in achenial characters, and similar to *S. brigalowensis* in terms of phyllary number. The leaf morphology is reminiscent of that of *S. pinnatifolius* var. *lanceolatus* and *S. pinnatifolius* var. *serratus*; however, it differs from those taxa in capitular morphology.

Selected specimens examined: **WESTERN AUSTRALIA**: Great Victoria Desert, Giles Rock between Warburton Mission and Blackstone Range on Docker Mission Road, A.C. Beaglehole 60206, 19.ix.1978 (MEL). **NORTHERN TERRITORY**: Mt Cavenagh, ca. 17 km SW of Kulgera H.S., N.N. Domer 4279, 19.viii.1973 (DNA); Alice Springs old telegraph station, D. Nelson, 11.viii.1961 (DNA); Palm Valley, G. Chippendale, 25.viii.1956 (DNA); 22 km west of Simpson's Gap turnoff on the Alice Springs to Hermannsburg road, C.H. Miller & J.L. Whaithe 515, 6.ix.1986 (CANB); Hart's Range, 10 km S of Hart's Range Police Station, I.R. Noble 33, 3.x.1977 (CANB); George Gill Range, Stokes Creek, A.C. Beaglehole 23393, 8.vii.1967 (MEL).

9. *Senecio lacustrinus* I.Thomps., sp. nov.

A *S. pinnatifolius* A.Rich., plantis plerumque annuis, phyllariis quam ligulis plerumque pluribus, acheniis dimorphis differt; a *S. eremicola* I.Thomps. caulibus saepe purpureis prope basin, foliis et segmentis angustioribus nodis paucioribus, phyllariis paucioribus differt.

Type: South Australia, far north-east, Strzelecki Track, ca. 40 km east of Murnpeowie, D.J.E. Whibley 2325, 16 Aug. 1968; holotype: AD.

Annual to c. 0.8 m tall, erect. *Taproot* well-developed; secondary roots slender. *Leaves* in mid-region of stems or major branches mostly 3–12 cm long, with marginal points 0–10 per side, mostly divided, occasionally not, thin on drying; base attenuate or becoming dilated; margin entire or with a few teeth or denticulations; undivided leaves narrow-elliptic; divided leaves with 2 or 3 narrow-triangular or linear to narrow-linear segments per side, with average position central. *Uppermost leaves*: segments more

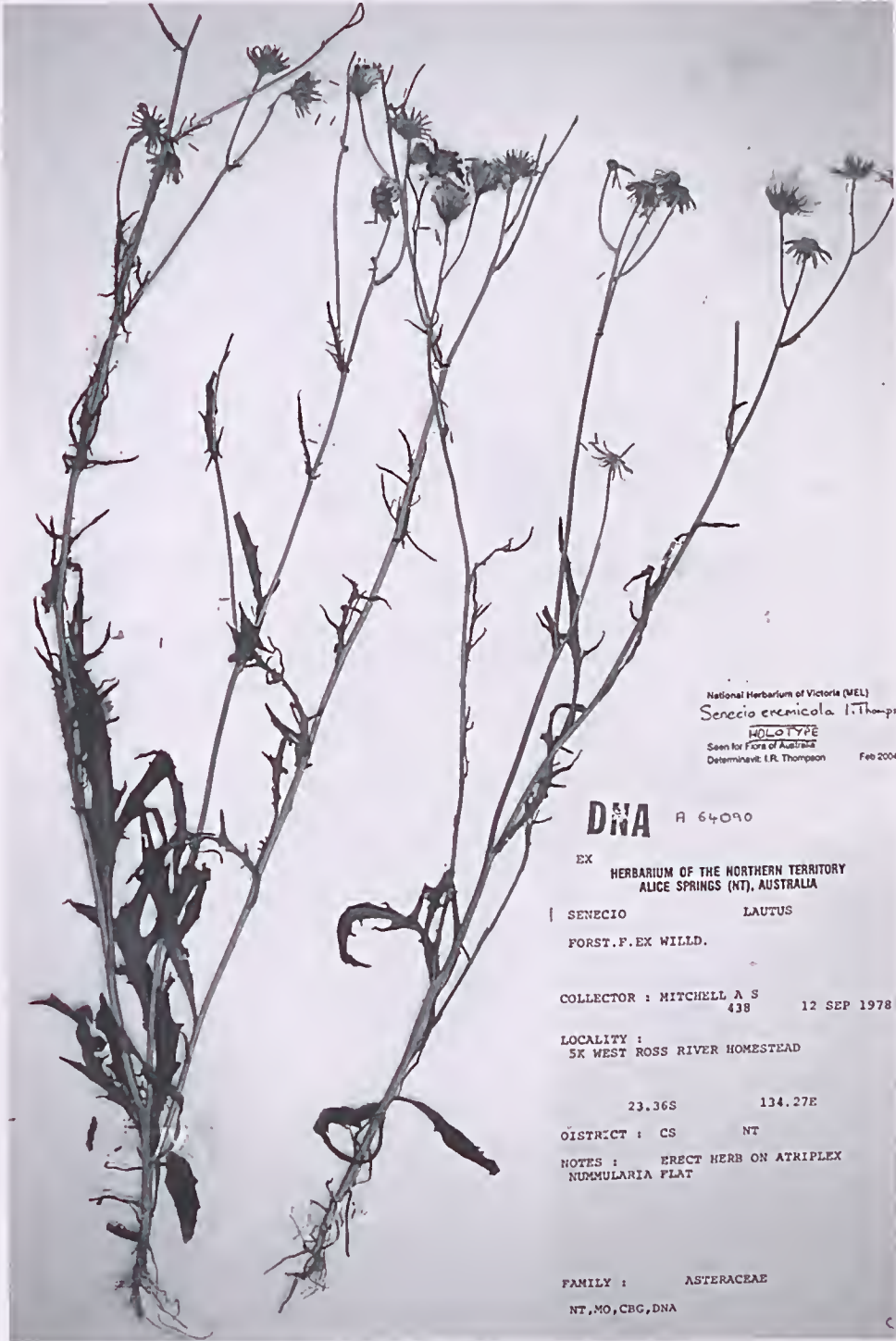


Figure 20. *S. eremicola* (holo: A.S. Mitchell 438 DNA).

proximal; base more dilated with often long segments. *Inflorescences* of 3–12 capitula. *Capitula*: calycular bracteoles 5–8, not imbricate at anthesis, narrow-ovate to narrow-lanceolate, 1.5–3.0 mm long, 0.4–1.0 mm wide, largely scarious, with margin nearly glabrous or with scattered short or long hairs; apex peracute, pigmented brown in zone c. 0.3 mm long, or hardly pigmented; involucre 5.0–9.0 mm long, 3–5 mm diam.; phyllaries c. 13 in all or most capitula, with apex pigmented light brown to blackish or hardly pigmented; stereome generally thin, drying yellow-green or yellow-brown (base of capitulum contrastingly drying dark bronze-brown); resin ducts weakly developed, usually pale; inner phyllaries: broader stereomes 0.8–1.5 mm wide; margin c. 0.3 mm wide 1 mm below apex, similar in width proximally; outer phyllaries: margin vestigial to c. 0.1 mm wide throughout. *Florets* 60–80; ligulate florets often c. 8, fewer than phyllaries, with ligule 10–15 mm long; corolla of disc florets 5–6 mm long. *Achenes* usually mildly dimorphic; disc achenes 2.8–4.0 mm long, generally c. 50–60% of length of phyllaries, golden, brown, olive-brown or green, with ribs not or hardly convex, papillose hairs in bands obscuring c. 50–70% of surface, appressed or slightly divergent, with l:w ratio 5–8, slightly exceeding pappus-ring; ray achenes commonly 3.0–4.5 mm long, dark-red, with hairs slightly longer and exceeding pappus-ring more clearly; attachment points on margin of receptacle enlarged. *Pappus* c. 5 mm long. (Fig. 21)

Flowers mostly winter to early spring.

Etymology: The epithet alludes to the typical occurrence of this species around lake or swamp margins (*L. lacustrinus*, of lakes).

Distribution and Habitat: Occurs in southern Australia in a broad band between latitudes 26° S and 32° S, and extending from Indarra Springs in far western Western Australia east through central South Australia to Bourke in north-western New South Wales (Fig. 16f). Grows in sandy or loamy soils, usually associated with ephemeral lakes and other water sources.

Notes: Similar to the more northerly distributed *S. eremicola* in habit and achene morphology but with fewer phyllaries per involucre and narrower leaf segments with fewer marginal points. Also similar to the more southerly and easterly distributed *S. spanomerus* but differing in the following ways: capitula slightly longer with never more than c. 13 phyllaries per capitulum, calycular bracteoles smaller relative to the involucre, achenes longer and the achenes of the ray florets generally longer than those of the disc florets. Furthermore, in *S. lacustrinus* the stereome of phyllaries are not as succulent (drying yellowish or greenish rather than coppery-brown) and its resin ducts are less prominent. It appears to be mostly an annual, but it can become shrub-like and develop semi-woody lower stems. *Senecio spanomerus*, on the other hand, is usually a perennial.

Specimens from Lake Throssell and Mt Elvire in south-central Western Australia have capitula 8 to 9 mm long, and the specimen from Lake Throssell is unusual in that it appears to be perennial. Both populations warrant further investigation.

Selected specimens examined: **WESTERN AUSTRALIA**: 43.2 miles [68 km] north of Cleary on road to Mouroubra, *B.H. Smith* 745, 20.ix.1986 (AD, CANB, HO, MEL, PERTH); Site L4C, 35 km E of Latham, on edge of Lake Mongers, *F. Keast L4C219*, 12.viii.1997 (PERTH); 5 km S of Morawa in samphire flats, *P.S. Short* 4368, 8.ix.1995 (MEL, PERTH); 33.4 km S of Perenjori on road to Wubin, *B.J. Lepschi BJL2725* & *T.R. Lally*, 27.vii.1996 (PERTH); c. 54 km from Paynes Find along road to Cleary (eastern edge of Lake Moore), *P.S. Short* 2589, *N.S. Lander* & *B.A. Fuhrer*, 26.viii.1986 (AD, BRI, CANB, HO, MEL, NSW, PERTH); 150.5 mile post [240 km] on Great Northern Highway (near Wongan Hills), *E.M. Scrymgeour* 2096, 19.ix.1967 (PERTH); 6 km S of Maleolm, *R.J. Cranfield* 9878, 6.vii.1995 (CANB, PERTH); ca. 112 km east of Caiguna Tank, *N.N. Donner* 4663, 10.ix.1973 (PERTH); 17.5 km NNW of Mt Glasse, Bremer Range, *K. Newbey* 5634, 16.viii.1979 (PERTH); Blue Hill, 24.5 km S of Mt Elvire Station, 235 km N of Southern Cross, *D.J. Edinger* 1827, 23.iv.2000 (PERTH). **SOUTH AUSTRALIA**: Great Victoria Desert, N.C.S.S.A. Survey, Camp 6, Serpentine Lakes, 164 km W of Vokes Hill junction, *C.R. Alcock* 8308,

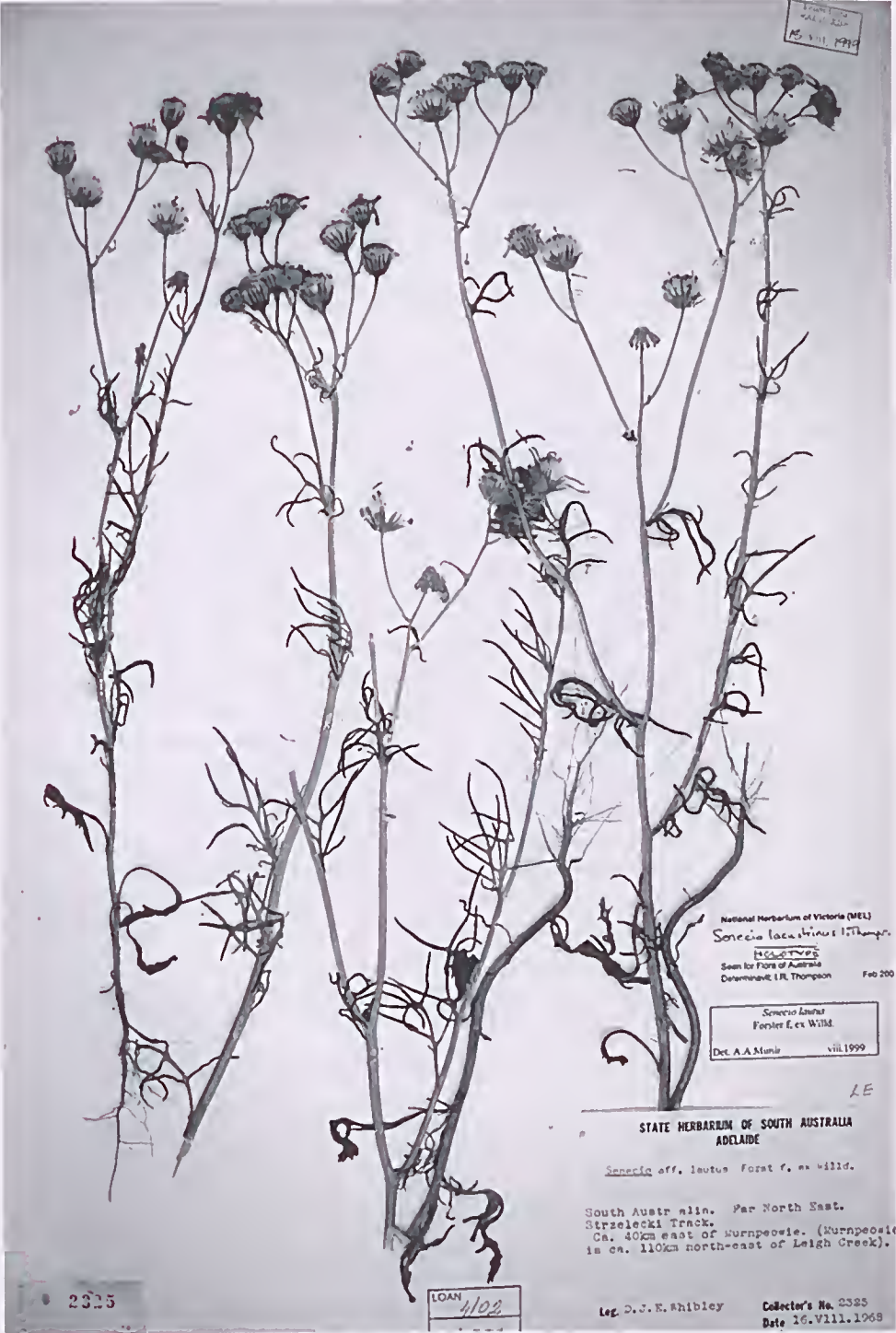


Figure 21. *S. lacustrinus* (holo: D.J.E. Whibley 2325 AD).

25.viii.1980 (AD, DNA, MEL); 1–1.5 km E of Mt Gunson, *B. Lay* 1587, 1.vii.1990 (AD, CANB, MEL); 27 m. [43 km] S of Marree, *A.C. Beauglehole* 28140, 2.viii.1968 (MEL); Paralana, springs 125 km N of Blinman, *J. Carriek* 2043, 24.viii.1968 (AD). **NEW SOUTH WALES:** Tero Creek Station, north of White Cliffs, *P. Martensz*, 3.xii.1968 (CANB); 3.5 km [2 ml] from Bourke, towards Cobar, *C.R. Dunlop* 1056, 26.viii.1969 (CANB); 68.3 km north-east of Louth on Bourke road, east of Darling river, *C.W.E. Moore* 7846, 15.ix.1978 (CANB).

10. *Senecio hamersleyensis* I.Thomps., *sp. nov.*

A *S. pinnatifolio* A.Rich. nodis foliorum paucioribus, margine foliorum semper integro, phyllariis quam ligulis pluribus; a *S. lacustrino* I.Thomps. basi foliorum nunquam dilatata, margine phyllariorum latiore, acheniis homomorphis, pilis acheniorum brevioribus differt.

Type: Western Australia, Hamersley Range, c. 19 km SE of Mt Hiditch, 138 km SE of Mt Tom Price, *W.R. Archer* 1308941, 13 Aug. 1994 (MEL).

Perennial to c. 1.5 m tall, erect. *Taproot* well-developed; secondary roots fine. *Leaves* in mid-region of stems or major branches mostly 3–8 cm long, with marginal points 0–2 per side, undivided or divided, thin on drying; base attenuate; margin entire; undivided leaves narrow-oblongate; divided leaves with 1 or 2 linear to narrow-linear or sometimes narrow-triangular segments per side, with average position central or slightly proximal to mid leaf. *Uppermost leaves* similar. *Inflorescences* of 1–10 capitula. *Capitula:* calycular bracteoles 6–10, not imbricate at anthesis, ovate to narrow-ovate, 1.0–2.0 mm long, 0.5–1.0 mm wide, largely scarious, with margin glabrous, sometimes with scattered short hairs; apex acute to peracute, pigmented light brown in zone c. 0.3 mm long; involucre (4.0–)5.0–7.0 mm long, c. 3 mm diam.; phyllaries c. 13 in all or most capitula, with apex light brown or hardly pigmented; sterome $\pm$ thin, drying yellow-green or yellow-brown; resin ducts well developed, usually orange; inner phyllaries: broader steromes 0.8–1.2 mm wide; margin c. 0.3 mm wide 1 mm below apex, broadening to 0.5 mm wide proximally; outer phyllaries: margin c. 0.1 mm wide 1 mm below apex broadening to c. 0.2 mm wide proximally. *Florets* 40–60; ligulate florets commonly c. 8, fewer than phyllaries, with ligule 10–15 mm long; corolla of disc florets 4.5–7 mm long. *Achenes* $\pm$ homomorphic, 2.5–3.0 mm long, generally 40–50% of length of phyllaries, brown, olive-brown, green, or reddish, with ribs not or hardly convex, with papillose hairs obscuring most of surface, appressed, with l:w ratio 3–5, not or barely exceeding pappus-ring. *Pappus* c. 5 mm long. (Fig. 22)

Flowers mostly winter to early spring.

Etymology: The epithet alludes to its centre of distribution in the Hamersley Ranges, Western Australia.

Distribution and Habitat: Occurs in far western Western Australia, mainly in the Hamersley Ranges; also further east along Savory Creek and further west in the Cape Range near Exmouth (Fig. 16g). Grows in gorges in red, gritty and skeletal soils on scree slopes and in sandy alluvial soils at the base of cliffs or amongst boulder rockpiles, usually with a southern aspect.

Notes: This species is similar to *S. lacustrinus* but is a perennial with attenuate leaf bases and entire leaf-margins, outer phyllaries with a broader margin, and with homomorphic achenes with shorter hairs.

Selected specimens examined: **WESTERN AUSTRALIA:** Dale Gorge, Hamersley Range, *A.S. George* 1043 (PERTH); Snell Gorge, *K.J. Atkins* 498, 28.vii.1979 (PERTH); Hamersley Range Nat. Park, Hancock Gorge, *G.W. Carr* 4946 & *A.C. Beauglehole* 48724, 10.viii.1974 (MEL, PERTH); Yardi Creek, *A.S. George* 10303 (MEL, PERTH); Hamersley Range, Knox Gorge, *A.C. Beauglehole* 11515 (MEL, PERTH); Wittenoom, *McGuire* 23, Jan. 1972 (PERTH); Keartland district: Savory creek, *G.J. Morse* 39, 5.vi.1984 (AD, CANB, PERTH).

11. *Senecio condylus* I.Thomps., *Muelleria* 21: 18–20 (2005)

Type: Western Australia, Perth, City Beach, summit of sand dune c. 1 km N of Oceanic Drive, *L. Haegi* 1871, 25 Aug. 1979; *holo:* PERTH; *iso:* AD, NSW.

Annual to c. 0.3 m tall, erect, commonly with scattered long hairs. *Taproot* small; secondary roots fine. *Leaves* in mid-region of stems or major branches mostly 3–8 cm long, with marginal points 10–20, divided or not, slightly fleshy; base becoming cordate and weakly clasping; margin dentate or serrate, with teeth often numerous; undivided leaves very narrow-elliptic, very narrow-oblong or oblanceolate; divided leaves with up to 3 c. oblong segments per side, with average position central. *Uppermost leaves* narrow-oblong to linear or lanceolate, with scattered hairs variably persistent; base of hairs often somewhat persistent on lower surface. *Inflorescences* of 3–20 capitula. *Capitula:* calycular bracteoles 8–12, sometimes slightly imbricate at anthesis, lanceolate to narrow-lanceolate, 2–3 mm long, 0.8–1.0 mm wide, with margin commonly hairy, pigmented dark purple apically with patch 1–1.5 mm long; involucre 4.0–6.0 mm long, 3–4 mm diam.; phyllaries c. 13 in all or most capitula, with apex intensely pigmented; stereome thin, often suffused with purple below apex; resin ducts fine, usually pale on drying; inner phyllaries: margin 0.3–0.6 mm wide; outer phyllaries: margin 0.1–0.2 mm wide. *Florets* 50–60; ligulate florets c. 8, fewer than phyllaries, with ligule 6–10 mm long; corolla of disc florets 5–6 mm long. *Achenes* dimorphic; disc achenes 2.0–3.0 mm long, brown, ribs $\pm$ flat; papillose hairs covering c. 50–90% of surface, appressed, with l:w ratio c. 4, hardly exceeding pappus-ring; ray achenes 2.8–3.5 mm long; papillose hairs more robust, $\pm$ completely covering surface, appressed, exceeding pappus-ring; carpopodium much wider; attachment points on margin of receptacle distinctly enlarged. *Pappus* of achenes of ray florets hardly developed; pappus of achenes of disc florets 4–5 mm long.

Flowers mostly winter and spring.

Distribution and Habitat: Occurs in south-western Western Australia, in the Perth region and recorded once from Busselton (Fig. 16h). Grows in sandy soils.

Notes: This species has recently been described in a revision of the *S. glossanthus* complex Thompson (2005). It appears to provide a link between this complex and the Australian lautusoid complex. An old Victorian record is likely to be a transient introduction due to shipping activity between Perth and Melbourne.

Selected specimens examined: WESTERN AUSTRALIA: Lake Richmond Nature Reserve, S side, *A. Bellman* 27A, 4.viii.2000 (PERTH); Port Kennedy bushland, 15 km N of Mandurah, *G.J. Keighery & N. Gibson* 858, 3.ix.1992 (PERTH); Fremantle, *N. Ingleton*, Oct. 1947 (PERTH); Busselton, *M. Koch*, Oct. 1909 (PERTH); Fortview Road, Swanbourne, *R.J. Cranfield* 382, 24.viii.1978 (MEL, PERTH). VICTORIA: Coode Island, *J.R. Tovey & C. French*, 1918. (MEL).

Names of uncertain application

Senecio lautus var. *pilosus* J.M.Black, *Trans. & Proc. Roy. Soc. S. Australia* 52: 230 (1928).

Type: South Australia, West Coast, Franklin Island – ca. 40 km south-west of Ceduna, *T.G.B. Osborn s.n.*, Jan. 1922; *holo:* AD; *iso:* NSW.

This specimen has a relatively dense cover of coarse hairs. It is perhaps closest to *S. spanomerus* but the achenes have shorter, more closely appressed papillose hairs than is typical of this species. If further collections and field observations show that it forms populations that are consistent morphologically in terms of the indumentum, it will possibly deserve taxonomic recognition.



Figure 22. *S. hamersleyensis* (holo: W.R. Archer 1308941 MEL).

Acknowledgements

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References

- Ali, S.I. (1964). *Senecio laetus* complex in Australia. I. Taxonomic considerations and discussion of some of the related taxa from New Zealand, *Australian Journal of Botany* **12**, 282–291.
- Ali, S.I. (1969). *Senecio laetus* complex in Australia. V. Taxonomic interpretations, *Australian Journal of Botany* **17**, 161–176.
- Beleher, R.O. (1993). The '*Senecio* aff. *laetus*' complex (Asteraceae) in Australia. I. Criteria for exclusion of laetusoid *Senecio* of Australia from *S. laetus sensu stricto* of New Zealand. *Australian Systematic Botany* **6**, 359–363.
- Beleher, R.O. (1994). The '*Senecio* aff. *laetus*' complex (Asteraceae) in Australia. II. Clarification of names given to pseudolaetusoid Australian specimens of *Senecio* by Richard and by Candolle. *Australian Systematic Botany* **7**, 71–85.
- Beleher, R.O. (1996). Australian alpine scapose radiate taxa of *Senecio* (Asteraceae) *Muelleria* **9**, 115–131.
- Bentham, G. (1867). *Senecio*. *Flora Australiensis* **3**, 661–673.
- Michael, P.W. (1992). *Senecio laetus sensu lato* – an unresolved complex. *Australian Systematic Botany Society Newsletter* **72**, 10–11.
- Ornduff, R. (1960). An interpretation of the *Senecio laetus* complex in New Zealand, *Transactions of the Royal Society of New Zealand* **88**, 63–77.
- Radford, I.J., Muller, P., Fiffer, S. & Michael, P.W. (2000). Genetic relationships between Australian Fireweed and South African and Madagascan populations of *Senecio madagascariensis* Poir. and closely related *Senecio* species. *Australian Systematic Botany* **13**, 409–423.
- Radford, I.J., Cousens, R.D., & Michael, P.W. (2004). Morphological and genetic variation in the *Senecio pinnatifolius* complex: are variants worthy of taxonomic recognition? *Australian Systematic Botany* **17**, 29–48.
- Scott, L.J., Congdon, B.C. & Playford, J. (1998). Molecular evidence that fireweed is of South African origin. *Plant Systematics and Evolution* **213**, 251–257.
- Thompson, I.R. (2005). Taxonomic studies of Australian *Senecio* (Asteraceae): 4. A revision of *Senecio glossanthus* and recognition of an allied species with long ligules. *Muelleria* **21**, 3–22.
- Walsh, N.G. (1999). *Senecio*. *Flora of Victoria* **4**, 941–965.

Index of Scientific Names

Epithets of accepted names are in roman (with bold type for new names) and synonyms are in *italics*. The taxon numbers refers to the number of the accepted species or varieties as given in the taxonomy section.

Name	Taxon no.	Page no.
Senecio		
<i>anacampserotis</i> DC.	2c	35
brigalowensis I.Thomps.	6	63
<i>capillifolius</i> Hook.f.	4c	51
<i>carnulentus</i> var. <i>angustissimus</i> Steetz	4b	45
<i>carnulentus</i> var. <i>latilobus</i> Steetz	4b	45
<i>condylus</i> I.Thomps.	11	73
<i>crithmifolius</i> A.Rich	4a	41
depressicola I.Thomps.	7	64
<i>endlicheri</i> DC.	4a	41
eremicola I.Thomps.	8	66
<i>gaudichaudianus</i> A.Rich.	4a	40
hamersleyensis I.Thomps.	10	72
lacustrinus I.Thomps.	9	68
<i>lautus</i> f. <i>pinnatifolius</i> (A.Rich.) Hochr.	4a	38
<i>lautus</i> G.Forst. ex Willd.		23
<i>lautus</i> subsp. <i>alpinus</i> Ali	4f	52
<i>lautus</i> subsp. <i>dissectifolius</i> Ali	4a, 5	41, 58
<i>lautus</i> var. <i>lanceolatus</i> Benth.	4c, 4d	47, 49
<i>lautus</i> subsp. <i>lanceolatus</i> (Benth.) Ali	4c, 4d	47, 49
<i>lautus</i> subsp. <i>maritimus</i> Ali	4a, 4g	41, 54
<i>lautus</i> var. <i>capillifolius</i> (Hook.f.) F.Muell.	4c	51
<i>lautus</i> var. <i>pilosus</i> J.M.Black	?	73
<i>macquariensis</i> DC.	4a	41
<i>madagascariensis</i> Poir.	1	30
<i>oligocephalus</i> DC.	4a	41
<i>pectinatus</i> var. <i>pleiocephalus</i> Benth.	4f	52
<i>pectinatus</i> var. <i>pleiocephalus</i> Rodway	4f	52
<i>pinnatifolius</i> A.Rich.	4	38
<i>pinnatifolius</i> var. 1 <i>sensu</i> N.G. Walsh, Fl. Victoria 4 (1999)	5	58
<i>pinnatifolius</i> var. 2 <i>sensu</i> N.G. Walsh, Fl. Victoria 4 (1999)	4d, 4g	49, 56
<i>pinnatifolius</i> var. 3 <i>sensu</i> N.G. Walsh, Fl. Victoria 4 (1999)	4d	49
<i>pinnatifolius</i> var. <i>alpinus</i> (Ali) I.Thomps.	4f	52
<i>pinnatifolius</i> var. <i>capillifolius</i> (Hook.f.) I.Thomps.	4c	51
<i>pinnatifolius</i> var. <i>lanceolatus</i> (Benth.) I.Thomps.	4d	49
<i>pinnatifolius</i> var. <i>latilobus</i> (Steetz) I.Thomps.	4b	45
<i>pinnatifolius</i> var. leucocarpus I.Thomps.	4h	58
<i>pinnatifolius</i> var. <i>maritimus</i> (Ali) I.Thomps.	4g	54
<i>pinnatifolius</i> var. <i>pinnatifolius</i>	4a, 4d	40, 49
<i>pinnatifolius</i> var. <i>pleiocephalus</i> (Rodway) Belcher	4f	52
<i>pinnatifolius</i> var. serratus I.Thomps.	4c	47
<i>rupicola</i> A.Rich.	4f	52
spanomerus I.Thomps.	5	58
<i>spathulatus</i> A.Rich.	2	31
<i>spathulatus</i> var. attenuatus I.Thomps.	2c	35
<i>spathulatus</i> var. latifructus I.Thomps.	2b	35
<i>spathulatus</i> var. <i>spathulatus</i>	2a	34
<i>tripartitus</i> A.Rich.	4a	40
<i>tripartitus</i> Steud.	4a	40
warrenensis I.Thomps.	3	38

‘Wild’ *Cistus* L. (CISTACEAE) in Victoria—future problem weeds or benign escapees from cultivation?

Ian Clarke, c/- National Herbarium of Victoria, Birdwood Ave, South Yarra, 3141.

Summary

Four species of the largely Mediterranean genus *Cistus* L. (Rock-roses) are reported as occurring in self-sustaining populations at various localities in Victoria: *C. creticus* L. at Clunes and Glenthompson, *C. inflatus* Pourr. ex Demoly (previously known, incorrectly, as *C. psilosepalus* Sweet) at Glenthompson and on the Mornington Peninsula, *C. monspeliensis* L. at Clunes, and *C. salviifolius* L. near Harecourt. The populations are briefly documented with a view to assisting assessment of the species’ weed potential, and to provide a benchmark for further monitoring. At present *C. inflatus* poses the greatest threat to indigenous vegetation. A key and descriptive notes to assist identification are provided. Difficulty with accurate identification of *C. creticus* is noted.

Introduction

The Rock-rose and Sun-rose Family, Cistaceae, contains eight genera and about 175 species of herbs and small shrubs, most of which are native in warmer parts of the northern hemisphere. Generally hardy plants, they have a preference for open, drier, sunny habitats, often on sandy or stony soils. Several genera, including *Halimium*, *Helianthemum* and *Cistus*, are cultivated in many countries including Australia.

The genus *Cistus* (Rock-rose) contains about 20 species of low shrubs with opposite leaves and showy flowers, mostly distributed in the Mediterranean region, particularly north-western Africa. Identification of plants has been complicated by the presence of natural and artificial hybrids, and many named cultivars. Confusion still exists, particularly in horticulture; plants have been seen offered for sale under incorrect names.

Perhaps the best known species is *C. ladanifer* L., a resinous, distinctively aromatic plant with showy white petals, each usually with a distinctive contrasting blotch of darker colour towards the base. In its native range in southern Europe, the species forms thickets on dry hills. Along with several other species, it is the source of the balsam ladanum (labdanum), a complex mixture of different ethereal oils and resins used in perfumery and cosmetics and, at one time, in medicine. The species is involved in numerous hybrids, one of which is the pink-flowered *C. x purpureus* Lam. (*C. ladanifer* x *C. creticus*, Fig. 1). This is one of the more commonly cultivated rock-roses in Melbourne, occasionally seen in ornamental roadside plantings where hardiness and drought tolerance are valued.

Localities of ‘wild’ *Cistus* populations in Victoria, based on herbarium records, were visited several times from 2002 to 2004. Voucher specimens of these occurrences are lodged at the National Herbarium of Victoria (MEL). Identification of *Cistus* specimens has made use of standard texts (e.g., Gardner and Page 1997), as well as the expertise of Mr Robert G. Page, an authority on the genus, who examined photographs and scans of specimens.

The genus in Victoria

Rock-roses have been in cultivation in Victoria for over a hundred years. Several specimens of garden origin collected just after 1900 exist at MEL. The earliest, possibly wild, Victorian collection is of *C. salviifolius* from Coode Island, near the mouth of the Yarra River, in 1908. It is not recorded whether the sample came from a wild or cultivated plant, although a note by botanist Jim Willis in 1950 on this specimen states “apparently an occasional garden escape, not truly naturalised”. In *The Aussie Plant Finder* (Hibbert 2004) seven species and a similar number of hybrids and cultivars are listed as being

available in nurseries. Recent visits to Melbourne nurseries reveal nine taxa readily available, a couple of which are additional to those in the *Plant Finder*. At least a dozen more species and cultivars are known from specialist collections.

Currently, four species are recorded as having escaped from or persisted beyond cultivation to form self-perpetuating populations in Victoria. These known 'wild' populations are documented briefly hereunder.

C. creticus

Plants identified as *Cistus creticus* (Fig. 2) have been located mixed with *C. inflatus* at a site near Glenthompson in western Victoria, and with *C. monspeliensis* at the Clunes Cemetery (see under those species for locality details). At both sites *C. creticus* occurs in smaller numbers than the other species, and appears to be 'holding its own' rather than posing any serious invasive threat.

Specimens from Glenthompson were first received at MEL in 1975, from plants believed to be descendants of an ornamental roadside plantation of various species including wattles and sheoaks established in about 1960. The species was relocated in September 2003 at what is believed to be the original site. Many individuals bore old capsules; a small amount of viable seed was recovered (one seed germinated when soaked for a few days in water after the seed coat was broken). None was then in flower. In late November 2003 numerous plants were observed flowering; some were bushy shrubs, the largest about 1.2 m tall. The pink flowered *C. creticus* plants were easily seen among the more common white flowered *C. inflatus*; they did not appear to be growing beyond the presumed limits of the original plantation.

At Clunes Cemetery, *C. creticus* was first recorded in early October 2003 during a search for *C. monspeliensis*. At the time, *C. creticus* was not in flower but many plants retained capsules from the previous season, from which a small amount of well-formed seed was recovered. A few flowers were observed in late November 2003. Individuals occurred in an area of slashed grasses and herbs (including a number of native species) north of the main entrance gate, down the slope from the graves area. The species obviously tolerates drastic 'pruning'; some individuals consisted of a number of short stems to about 15 cm long arising from an older central stock. Closer to the front fence, away from mowing, a few taller plants attained a height of about 40 cm. The species appeared confined to a small area, and was far less common than *C. monspeliensis*.

One plant of *C. creticus* has been found with a population of *C. inflatus* on a weedy roadside at Hadspen in Tasmania.

C. inflatus

The first Victorian collections of *Cistus inflatus* (Fig. 3) were made in 1975 from a self-perpetuating population near Glenthompson in the Western District. Several other populations have more recently come to attention on the Mornington Peninsula around Arthurs Seat, Dromana, and from Ferrero Reserve, Mount Martha.

Labels on the first herbarium specimens of this species from Glenthompson in 1975 are informative, and assist in evaluating the current status of the population. The locality is given as the "south side of Glenelg Hwy, c. 7 km east of township". Other notes record: "growing in an old roadside plantation (plantation trees were an *Acacia* sp. ...)" and "plants ... were planted in about 1960" as well as "the plant occurs throughout the plantation area (50 yards x 10 yards) and there are a few scattered plants outside the fence now. In the plantation area there would be at least one plant in every square yard. ... The white flowering specimen is the dominant one. There are only a few purple flowered plants." The 'purple flowered plants' are believed to be a form of *C. creticus*, see above. Petals of *C. creticus* when fresh are pink, but fall readily and, on drying, can become darker which could account for the colour being recorded as purple.

In September 2003 a population presumed to be the same as that recorded above was located about 6 km east of Glenthompson. Several dense patches of mature shrubs up to about 60 cm tall were accompanied by numerous individuals scattered throughout the area. Many plants were in bud, a couple had open flowers. Limits of the original plantation were not evident, but numerous planted wattles and sheoaks were surviving although none was particularly healthy. The previous seasons had been exceptionally dry. Two *Cistus* species were noted with *C. creticus* much less frequent than *C. inflatus*. On a subsequent visit to the site in late November 2003, both species were flowering well. It appeared that *C. creticus* was probably still within the presumed boundary of the original plantation, but *C. inflatus* had clearly spread, with plants occurring over an area measuring about 95 m parallel to the road and 15 m out from the fence of the adjacent paddock. Several plants had established within the windbreak planting along the edge of this paddock. A narrow fire break, roughly slashed or ploughed, passed adjacent to the population and may have assisted the species' spread. Small areas of basalt plains grassland with indigenous species of *Austrodanthonia*, *Anrostipa*, *Acaena*, *Chrysocephalum*, *Wahlenbergia* and other species occur along the roadside to the west and east, as well as occupying a narrow strip between the *Cistus* and the road.

On the Mornington Peninsula, *C. inflatus* was first noted in the mid 1990s in bushland below the Northern Lookout at 'Seawinds' (off Purves Road, Dromana). This was one of the original estates on the Peninsula, and is now managed by Parks Victoria. Presumed to have originated from plants believed to have been cultivated in the garden at Seawinds, the population in 1996 extended from the slope immediately below the Northern Lookout south-west about two-thirds of the way to the Western Lookout, and down the slope to the nearby walking track and possibly beyond. It consisted of fairly closely spaced mature shrubs about 1 m tall, invading *Eucalyptus viminalis* ssp. *pyroriana* / *Allocasuarina littoralis* grassy woodland. On 21 January 1997 wildfire burnt the area, killing above-ground plants in the population. Numerous seedlings subsequently germinated both above and below the walking track that roughly follows a contour below the Lookout. The germination is believed by local observers to have represented a very high proportion of the seed bank in the soil. In the autumn and winter of 1998 all seedlings found below the walking track were removed by hand. Plants above the walking track were noted as beginning to flower. Between 2000 and 2003, plants found in the area were sprayed annually with herbicide. In April 2003, only occasional young plants up to about 15 cm tall (presumably germinated in 2002) were evident.

Also from Dromana, specimens of *C. inflatus* were collected and forwarded to MEL in October 1996 from 30 m north of the intersection of LaTrobe Parade and Bunurong Track. The population was stated to occupy an area with a radius of about 200 m centred further north on the 'Heronswood' estate, and had been observed over a ten year period to be seeding and slowly increasing in area. The original collector, at the time employed at Heronswood, reported that the species was not then grown on the estate. At this time, the population had extended south into *Eucalyptus* / *Allocasuarina littoralis* open woodland. In the same year another observer independently recorded plants on the north-west side of LaTrobe Parade opposite Heronswood.

In April 2003 numerous plants 5 to 65 cm tall were noted near the presumed location of the original collection, now apparently with more houses occupying part of the site. The population extended some 140 m along the edge of degraded, weedy indigenous vegetation under power lines running north-east from LaTrobe Parade, adjacent to the boundary with private property. Plants favoured gaps, but tolerated shading from other weeds such as *Chrysanthemoides monilifera* (L.) Norl. subsp. *monilifera* (Boneseed), and competition from *Penisetum clandestinum* Hochst. ex Chiov. (Kikuyu Grass).

Plants were also observed further north, beyond houses, on the steep south-east bank of the Mornington Peninsula Freeway, immediately north-east of the LaTrobe Parade bridge.

At Mount Martha, *C. inflatus* was collected from Ferrero Reserve, off the end of Seppelt Avenue, in January 1999. Notes on the herbarium label record that thousands of plants occurred at the site. In April 2003 the species was persisting, in reduced numbers, despite sporadic efforts at eradication. Small areas where adult plants had been burnt in previous months supported dense seedling growth. Plants occurred on the south-west side of Seppelt Avenue for some 80 m, and the population extended back about 180 m forming a rough crescent shape on the gentle slope above the sports ground. Most of the Rock-roses at this site occur in an area of roughly mown grassy weeds (with a few herbaceous indigenous remnants) with scattered individuals and clumps of native shrubs including *Acacia mearnsii* De Wild., *A. longifolia* (Andrews) Willd. subsp. *sophorae* (Labill.) Court, and *Leptospermum laevigatum* (Gaertn.) F. Muell. In January 2004 numerous *Cistus* plants were dead, and the great majority of those seen were small (up to about 20 cm tall), presumably a consequence of continuing control measures. A few outlying plants of *C. inflatus* were noted more than 300 m from the south-west end of this main population, and several dead plants were seen between these and the main group. Another small group of plants occurred on the north-east side of Seppelt Avenue, between the road and adjacent houses.

C. inflatus is also known from Hadspen in Tasmania, and reported to be locally naturalised in the Mt Lofty Ranges in South Australia.

C. monspeliensis

In November 1996, *Cistus monspeliensis* (Fig. 4) was reported as naturalised at the Clunes Cemetery (about 2 km west of Clunes off the Maryborough Road). Label data from this first collection noted that the species had been present at the Cemetery for more than 25 years, as well as "young plants prolific this year", and "attempts to control with herbicide as yet unsuccessful". In early October 2003 the species was still common despite evidence of continued spraying in the form of numerous deformed or dead plants. Seedlings were not uncommon. Plants were also observed growing on the roadside down the slope beyond the front fence of the Cemetery, although casual inspection revealed none in the adjacent eucalypt open forest on the other three sides. No plants were flowering at this time, but many bore old capsules, some of which still contained well-formed seeds. Numerous flowers were seen in mid November. Several mature shrubs about a metre or more tall were noted on the northern boundary. The species obviously tolerates rough treatment as many severely 'pruned' plants were growing in slashed grassy areas away from grave sites. *Cistus creticus* has also been seen at this site (see previous section).

An unconfirmed and undated note on an herbarium specimen records that the species is also common in remnant bushland around a small reservoir in the Ballarat district.

C. salviifolius

A small population of *Cistus salviifolius* (Fig. 5) from the east side of North Harcourt Road about 8 km (direct line) north of Harcourt was reported to MEL in 1999. The collector noted that plants had been observed at the site for some 15 years.

In December 2002 this dense population, including numerous seedlings, extended some 90 m along the eastern bank above the road. Numerous plants also occurred among weedy grasses and thistles along the west side of the road for some 170 m.

In November 2003, the population was flowering prolifically. Residents who have lived nearby for 13 years say that the population was well established when they arrived and has roughly doubled in size during their tenure. They suggested that the origin of this species could lie with rabbit trappers who had established a camp there around the time of the Depression in the 1930s. North Harcourt Road at the time was a main thoroughfare to Bendigo from the south. A previous attempt at control of the population by burning was unsuccessful.

In the ACT, *C. salviifolius* was first collected in 1988 from bushland in Black Mountain Reserve, and in November 1999 about 50 plants were noted there.



Fig. 1 *Cistus x purpureus* (*C. creticus* x *C. ladanifer*) is one of the more commonly cultivated Rock-roses in Melbourne. These pink flowered, resinous shrubs have a characteristic dark patch on each petal, a trait derived from *C. ladanifer*. Five petals are usually visible. [I.C. Clarke 3350]. Fig. 2 *Cistus creticus* — flowering shoot from the population growing east of Glenhompson. Plants have a greyish-green aspect and mostly pink flowers (with yellow in the centre) about 5 cm diameter. [I.C. Clarke 3289]. Fig. 3 *Cistus inflatus* — flowering shoot from the population east of Glenhompson. Plants have a dark green aspect and white flowers (with some yellow in the centre) about 4 cm diameter. One petal has fallen from the upper flower. [I.C. Clarke 3264]. Fig. 4 *Cistus monspeliensis* — flowering stems from plants at the Clunes Cemetery. Flowers are mostly white (with some yellow in the centre) and about 3 cm in diameter. [I.C. Clarke 3286]. Fig. 5 *Cistus salvifolius* — plants bear white flowers (with yellow centres) about 3 cm diameter, with scarcely crinkled petals. From the population north of Harcourt. [I.C. Clarke 3245]

Descriptions and key to 'wild' *Cistus* in Victoria

The following generic description has been compiled from published sources (e.g., Arrington and Kubitzki 2003, Warburg 1968). Species descriptions are largely based on locally collected material (specimens from fairly tough habitats), augmented by published descriptions (Gardner and Page 1997, Jessop 1986).

Plants shrubby, sparse to dense, sometimes small but up to 2 m or more tall, usually aromatic; some species resinous; often hairy, sometimes with a mixture of stellate, glandular, and simple hairs; *leaves* opposite, exstipulate, sessile or petiolate or in some species the blade narrowing to a petiole-like base (here subsequently termed pseudopetiolate), in some species with 3 main veins from the base; *flowers* showy, usually in cymes, rarely solitary, 2 to 10 cm (or more) in diameter; *sepals* 3 in some species or more often 5 (or variable in hybrids), rather persistent; *petals* 5, often mostly pink or white, with a small area of yellow at the base, often erumped in bud and in some species remaining erumped apically in the open flower, falling readily; *stamens* numerous, often conspicuously yellow (including filaments), much shorter than the petals and forming a rather close-knit circle around the ovary; *carpels* 5 (6–12); ovary superior, incompletely divided by narrow intruding placentas (placentation sometimes appearing axile); *fruit* a loculicidal capsule; seed coat of two layers, the outer thin, the inner firm.

Colour of the petals usually changes on drying with white petals turning yellow, and pink petals (at least initially) often darkening appreciably or becoming more reddish. Individual flowers are short-lived, petals usually falling within one day, but plants often flower for an extended period.

Colour photographs of many species and cultivars can be found in Phillips and Rix (1989), and Briekell (1989). In *European Garden Flora* (Gardner and Page 1997) references to photographs are provided for most entries (species, hybrids, cultivars). Excellent photographs of *C. creticus* are available on the Angiosperm Phylogeny Group website: www.mobot.org/MOBOT/Research/APweb (Go to "Malvales", then "Cistaceae", then take the "photos – collection" link).

Cistus differs from all other genera of the family in having 5 (rarely 6–12) carpels, other Cistaceae having 3 (rarely 2).

1. Plants greyish green; flowers mostly pink; style 3–4 mm long.....*C. creticus*
1. Plants (darkish) green; flowers mostly white; style $\leq$ 0.5 mm 2
2. Leaf blades narrow (c. 5–8– times as long as wide); outer sepals narrowed to or obtuse at the base*C. mouspelieusis*
2. Leaf blades broader (c. < 4 times as long as wide); outer sepals cordate at the base 3
3. Most leaves narrowly pseudopetiolate; flowers to c. 3 cm diameter.....*C. salviifolius*
3. Leaves sessile; flowers c. 4 cm diameter.....*C. inflatus*

C. creticus L., Sp Pl. edn 2: 738 (1762)

Variable, rather bushy, greyish-green *shrub* up to 1 m or more tall, c. 1 m diameter; indumentum of stellate hairs throughout, with long simple hairs prominent on calyces, and also on inflorescence branches and near leaf axils, and with glandular hairs present on inflorescence; *branchlets* densely hairy, often appearing whitish-shaggy when young; *leaf blades* (narrow-) elliptical to obovate (tending to lanceolate immediately below inflorescence, and grading into $\pm$ sessile bracts above), c. 1.5–3 x 0.5–1 cm (to 5 x 1.5 cm or more on young growth), greyish-green, paler below, apex obtuse or broadly acute, margin often undulate, blade narrowed gradually to quite abruptly to a petiole-like base up to c. 1 cm long; 'petiole' bases sometimes united across the node to a small degree on young growth; *flowers* few to c. 6 in terminal $\pm$ symmetrical cymes, to c. 5 cm diameter;

sepals 5, persistent; *petals* obovate, obtuse and crumpled apically, c. 2.5 x 2 cm, pink with a small area of yellow at the base; *style* 3–4 mm long; *open capsules* c. 9 mm long, brown, silky-villous with semi-appressed hairs; *seeds* irregularly rounded-blocky, 1–1.5 mm long, brown, outer layer of seed coat wrinkled. Figure 2.

Indigenous to the Mediterranean region—southern Europe, northern Africa and western Asia.

Selected specimens examined: **VICTORIA:** Volcanic Plain, Clunes Cemetery, c. 2 km west of Clunes, 37° 18'S 143° 46'E, 1 Oct 2003, *I.C. Clarke* 3269 (MEL); 25 Nov 2003, *I.C. Clarke* 3285 (MEL); Midlands, South side of the Hamilton - Ballarat Highway, approx. 7 km east of Glenthompson, 37° 37'S 142° 37'E, Aug 1975, *S. Collins s.n.* (MEL 604914A); Volcanic Plain, south side of Glenelg Highway, c. 6 km east of Glenthompson, 37° 39'S 142° 37'E, 27 Nov 2003, *I.C. Clarke* 3289 (MEL).

Some difficulty has been experienced in identifying Victorian plants. *C. creticus*, itself a variable species, hybridises with *C. albidus* L. to produce *C. x canescens* Sweet. These species do not meet in nature, but in cultivation, “The offspring, *C. x canescens*, are fully fertile and appear to be self-compatible, the second generation showing every possible shade of variation on the spectrum between the two species. They will also back-cross with either grandparent or with any siblings. As a result of this we have in cultivation ... a mongrel race which is impossible to classify in any meaningful way.” (R.G. Page, in litt., 29 January 2004.) The preceding comments relate to the European context and, as there is no way of knowing the origin of the plants first established in the Victorian populations, some version of the European story may apply here.

C. albidus and *C. x canescens* are both known in horticulture in Victoria, albeit to a limited extent at present. Compared to *C. creticus*, *C. albidus* has sessile leaves with plane margins and three (or more) nerves from the base, and more compact inflorescences. Although the leaf blades of ‘wild’ Victorian plants sometimes taper to a rather less than distinct ‘petiole’, adoption of the name *C. creticus* appears the most practical option at present. A scan of a specimen from the population at Glenthompson had “much in common with forms of *C. creticus* from Corsica” (R.G. Page, in litt., March 2004).

C. inflatus Pourr. ex Demoly, Acta Bot. Gallica 144:42 (1998)

Bushy dark green *shrub* to about 1 m tall or often less; indumentum of stellate hairs, longer simple hairs (the latter prominent on branchlets and calyces) and glandular hairs (the last mostly on peduncles and calyces); *leaves* sessile, (lanceolate-) elliptical to oblong (-oblanceolate), c. 2–5 x 0.5–2 cm (possibly larger on vigorous growth), mid to dark green above, sometimes with a purplish cast, paler below, apex broadly acute; *flowers* few to c. 10 or more in terminal ± symmetrical cymes, white with yellow centre, c. 4 cm diameter; *sepals* 5, persistent, becoming brown and papery in fruit, broadly ovate, acuminate, the outer cordate at the base, broader and with recurved margins; *petals* white (drying yellow) with a small area of yellow at the base, obovate; *style* to c. 0.5 mm; *stigma* appearing ± sessile; *open capsules* c. 6–7 mm long, brown; *seeds* rounded-blocky, c. (1–) 1.5 mm long, surface minutely granular, dark reddish-brown; cotyledons ± oblong c. 9 x 1.5 mm, glabrous but for short marginal hairs, green. Figure 3.

Indigenous to Portugal, western Spain, and western France.

This species has been widely known, incorrectly, as *C. psilosepalus* Sweet (see Demoly 1998), and may be offered for sale in nurseries under that name. Conspicuous features are the outer sepals cordate and very broad, with recurved margins, particularly obvious in the fruiting stage.

Selected specimens examined: **VICTORIA:** Gippsland Plain, Mornington Peninsula, Dromana, 30 m N of the intersection of LaTrobe Parade and Bunurong Track, 38° 21'S 144° 58'E, 12 Oct 1996, *W.L. Ashburner* 2011 (MEL); Mt Martha, Ferrero Reserve, S side of Balcombe Creek, 38° 15' 51"S 145° 01' 29"E, 19 Jan 1999, *G. Walker s.n.* (MEL 2057994); Dromana, SE bank of

Mornington Peninsula Freeway, immediately east of LaTrobe Parade overpass, 38° 21' S 144° 57' E, 30 Apr 2003, *I.C. Clarke 3260* (MEL); Volcanic Plain, South side of Glenelg Highway, c. 6 km east of Glenthompson, 37° 39' S 142° 37' E, 12 Sep 2003, *I.C. Clarke 3264* (MEL, CANB). TASMANIA: Hadsen, roadside to disused jetty, near Rutherglen Village, 41° 30' 56" S 147° 03' 47" E, 1 Jan 2004, *M.L. Baker 1141 and M.F. Dureto* (AD, CANB, HO, MEL, NSW).

C. mouspeliensis L., Sp Pl. 1:524 (1753)

Rather upright, open, resinous, dark green *shrub*, slender when young, to about 1.2 m tall; *branchlets* resinous, sticky; indumentum of very short glandular hairs, with short stellate hairs (the latter mostly on leaf undersides and apex of ovary/capsule), and long simple hairs most prominent on calyces, pedicels and peduncles, but also on young leaves; *leaves* more or less sessile, lanceolate to narrow-elliptical to (narrow-) oblong, c. 2–5 x 0.2–1 cm (but to 7.5 x 1.5 cm on vigorous young growth), dark green above, paler below, apex acute, margin recurved on drying; *flowers* few to c. 10 or more in one-sided terminal cymes, white with yellow centre, to c. 3 cm diameter; *sepals* 5, tapering or rounded-obtuse at the base; *petals* white (drying yellow) with small area of yellow at the base, broadly obovate, truncate to slightly emarginate, c. 1.3 x 1.3 cm when fresh; *style* to c. 0.5 mm or less; *open capsules* c. 4 mm long, glossy dark reddish brown, glabrous but for short dense stellate hairs towards the apex; *seeds* rounded-blocky, c. 1.5–2.6 mm long, rather glossy dark brown, outer layer of seed coat wrinkled, Figure 4.

Indigenous to southern Europe, northern Africa, Canary Is.

The plants are conspicuously resinous, with white flowers in one-sided ($\pm$ scorpioid) terminal cymes.

Selected specimens examined: VICTORIA: Volcanic Plain, roadside in front of Clunes Cemetery, c. 2 km west of Clunes, 37° 18' S 143° 46' E, 25 Nov 2003, *I.C. Clarke 3286* (MEL, CANB); Clunes Cemetery, 37° 18' S 143° 46' E, 1 Oct 2003, *I.C. Clarke 3268* (MEL, CANB); Clunes Cemetery, 37° 17' 30" S 143° 46' E, 18 Nov 1996, *I. Macfarlane s.n.* (MEL 2035097).

C. salviifolius L., Sp Pl. 1:524 (1753)

Dense, rather wiry, divaricate, dark greenish variable *small shrub* to perhaps 1 m tall but often smaller; indumentum of rather even, shortish stellate hairs throughout, older parts glabrescent, calyx and 'petioles' also with apparently simple hairs; most *leaves* narrowly pseudopetiolate (but for those immediately below inflorescence which are sessile), blades (broadly-) ovate to oval, c. 1.5–4.5 x 0.6–2.5 cm, dark green above, paler below, apex obtuse (to acute on some cultivated plants), base obtuse to truncate; *flowers* mostly solitary in upper axils on pedicel/peduncles up to 10 cm long, but sometimes up to 5 in a cyme; to c. 3 (–5 or more) cm diameter, reported to be nodding in bud; *sepals* 5, persistent; *petals* white (drying yellow) with a small area of yellow at the base, scarcely crinkled, obovate, truncate to slightly emarginate, c. 1.3 cm wide when fresh; *style* very short; *open capsule* c. 6 mm long, dark reddish-brown, rather glossy below wispy appressed hairs; *seeds* rounded to slightly angular, c. 1.5 mm long, dark brown, outer layer of seed coat markedly wrinkled, Figure 5.

Indigenous to southern Europe and northern Africa.

Conspicuous features are the more or less solitary, long-stalked flowers with scarcely crinkled petals. Features reported as distinctive but not checked on local plants include the nodding buds, and capsules somewhat flattened at the apex, surrounded by semi-spread persistent sepals.

Selected specimens examined: VICTORIA: Midlands, c. 8 km (direct line) just E of N of Harcourt, E side of North Harcourt Rd, 36° 56' S 144° 17' E, Nov 1999, *I. Higgins s.n.*, MEL 2156654; c. 8 km (direct line) just E of N of Harcourt, on W side of North Harcourt Rd, 36° 56' S 144° 17' E, 4 Dec 2002, *I.C. Clarke 3245*, (MEL, CANB); NEW SOUTH WALES: Southern Tablelands, end of Rani Rd, SW slope of Black Mountain Reserve, Canberra, 35° 16' S 149° 07' E, 11 Nov 1999, *B. J. Lepschi 4236* (AD, HO, K, MEL, MO, NSW).

Discussion

The Mediterranean region is well known as a source of weedy introductions in Victoria. Carr *et al.* (1992) report 299 species from the Mediterranean basin that have become established.

Arrington and Kubitzki (2003) concisely summarise features of the Cistaceae including some points of particular relevance here:

- the Cistaceae have typical pollen flowers and usually do not produce nectar (although some *Cistus* are exceptions)
- numerous species of bees, flies, beetles and ants visit the flowers
- Cistaceae seeds are notable for their hard coat that minimises water loss and water uptake, features that result in seed dormancy and extended viability
- *Cistus* species inhabit “dry scrub or open woodland”, and are “colonists after fire”.

These are characteristics of species that are not specific in their pollinators, each flower being capable of producing a number of hard-coated seeds that will contribute to a growing seed bank. (However, not all *Cistus* seeds are hard-coated—a low percentage, varying with species, lack the hard coat and are not subject to dormancy. R.G. Page, in litt., 2004.) Although individual flowers are short-lived, each plant produces many flowers each year. Overseas experience (R.G. Page, in litt., 2004) as well as observations of local populations suggest that *Cistus* seeds are not usually speedily dispersed far from parent plants. Thus the term ‘colonists’ as used by Arrington and Kubitzki presumably refers to the germination of seeds after fire rather than the capacity of species to move readily into an area not previously occupied. This is supported by prolific *C. inflatus* germination on the Mornington Peninsula following fire, either controlled or uncontrolled. Observations of *C. inflatus* at Ferrero Reserve, *C. monspeliensis* at Clunes Cemetery, and *C. salviifolius* near Harcourt seem to indicate that these populations have increased in size downhill, perhaps aided by gravity and water.

While *Cistus* seeds are possibly dispersed in damp soil adhering to birds or animals, it seems more likely that human activity would be implicated in establishment of new Victorian populations. Seeds of *C. salviifolius* from near Harcourt for example could be moved to new localities through works modifying road alignment, or roadside maintenance such as mowing or drain clearing. Density of *C. salviifolius* on the east side of the road virtually excludes all other species, and its ability to succeed among thistles and other weeds on the western roadside, mark this species as a strong competitor.

Given that four species of *Cistus* have escaped from or persisted beyond cultivation, and at least one (*C. inflatus*) has invaded indigenous vegetation, intentional cultivation of *Cistus* species constitutes a weed risk that increases with proximity to indigenous vegetation.

Randall (2002) compiled records from various sources of at least 8 *Cistus* species (including the 4 here discussed) naturalised or weedy in numerous countries. *C. creticus*, *C. monspeliensis*, and *C. salviifolius* are recorded as weedy in coastal regions of California (Hickman 1993), and *C. creticus*, *C. ladanifer*, and *C. inflatus* (as *C. psilosepalus*) are recorded as naturalised in New Zealand (Sykes 1988).

Observations from overseas (R.G. Page, in litt., 2003 & 2004) and Victoria confirm that *Cistus* species, as well as the hybrid *C. albidus* × *C. creticus* (= *C. x canescens*), and the cultivar ‘Grayswood Pink’ (*C. parviflorus* Lam. × unknown) are fertile and set seed readily. Other hybrids, mostly those between species within the same section of the genus, will produce some fertile seed in some seasons. On the other hand *C. x purpureus* (Fig. 1) and *C. x pulverulentus* Pourr. (*C. albidus* × *C. crispus* L.—usually sold as the cultivar ‘Sunset’) appear consistently sterile. Similarly, *C. x skanbergii* Lojze. (seen for sale in some Melbourne nurseries incorrectly labelled as the cultivar ‘Silver Pink’) does not appear to set fruit. For responsible horticulturists offering *Cistus* plants for sale, and for gardeners who wish to enjoy these attractive floriferous shrubs, being selective as to which forms to grow is warranted. Cultivated plants should be monitored for fertility, and unwanted plant material disposed of with care.

Carefully collected samples of weedy plants are welcomed by the National

Herbarium of Victoria. Where possible specimens should include a leafy branch about 30 cm long, preferably with flowers and or fruits attached, accompanied by notes on the locality of collection, collector's name, and date of collection. The locality should be sufficiently detailed to enable the population to be relocated at a later time. Additional notes, providing information not obvious from the sample are particularly useful, such as flower colour and scent, and population extent, history in the area, and rate of spread. Specimen donations can be forwarded by post (early in the working week if fresh, or any time if pressed and dried) to the Identification Service, National Herbarium of Victoria, Birdwood Ave, South Yarra, 3141.

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The assessment of the weed potential of *C. inflatus*, in particular, has been greatly assisted by information recorded with specimens lodged at the National Herbarium of Victoria. The efforts of Herbarium Officers in pursuing such information, following receipt of the initial sample, are applauded and gratefully acknowledged, as are those of the all-too-few collectors who provide it spontaneously.

References

- Arrington, J.M. and Kubitzki, K. (2003). 'Cistaceae', in K. Kubitzki (ed.), *The Families and Genera of Vascular Plants* 5: 62–70. Springer-Verlag: Berlin.
- Briekell, C. (1989). *The Royal Horticultural Society Gardener's Encyclopedia of Plants and Flowers*. Dorling Kindersley Ltd: London.
- Carr, G. W., Yugovic, J.V., and Robinson, K.E. (1992). *Environmental Weed Invasions in Victoria. Conservation and Management Implications*. Dept Conservation and Environment: East Melbourne.
- Demoly, J-P. (1998). L'identité du *Cistus psilosepalus* Sw (Cistaceae). *Acta Botanica Gallica* 144: 35–44. (Paper written in French, dated 1997.)
- Gardner, M.F. and Page, R.G. (1997). '*Cistus* L.' in Cullen, J. et al. (eds), *European Garden Flora* 5: 263–266. Cambridge Univ. Press: Cambridge.
- Hibbert, M. (2004). *The Aussie Plant Finder*. Florilegium: Glebe, NSW.
- Hickman, J.C. (ed.) (1993). *The Jepson Manual. Higher Plants of California*. Univ. of California Press: Berkeley.
- Jessop, J.P. (1986). 'Cistaceae', in J.P. Jessop and H.R. Toelken (eds), *Flora of South Australia*, 2: 871–2. SA Govt Printing Division: Adelaide.
- Phillips, R. and Rix, M. (1989). *Shrubs*. Pan Books Ltd: London.
- Randall, R.P. (2002). *A Global Compendium of Weeds*. R.G. and F.J. Richardson: Meredith, Vic.
- Sykes, W.S. (1988). 'Cistaceae', in Webb, C.J. et al., *Flora of New Zealand* 4: 535–7. Botany Div., DSIR: Christchurch.
- Warburg, E.F. (1968). 'Cistaceae' in Tutin T. G., et al. (eds) *Flora Europea* 2: 282–284. Cambridge Univ. Press: Cambridge.

Thelymitra reflexa (Orchidaceae) a new rare species
from Victoria, Australia

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Abstract

Thelymitra reflexa Jeanes from Victoria, Australia, a rare new species of the *Thelymitra pauciflora* R.Br. complex, is described as new and illustrated. Its distribution, habitat, biology and conservation status are discussed. A partial key is provided to distinguish *T. reflexa* from other members of the *T. pauciflora* complex.

Introduction

Thelymitra J.R.Forst. & G.Forst. is a complex genus of orchids consisting of about 95 described species, several described natural hybrids and at least 15 undescribed taxa. It is concentrated in higher rainfall areas of temperate Australia, but a few species occur in tropical northeastern Australia, about 20 species occur in New Zealand (15 endemic) and a few species occur in Indonesia, New Caledonia, New Guinea and the Philippines.

In my recent revision of the *Thelymitra pauciflora* R.Br. complex (Jeanes 2004), the group was discussed in some detail and 15 new species were described. Members of this complex are characterized by their small (tepals usually <15 mm long), unscented, facultatively autogamous, generally blue, mauve or purplish, unspotted flowers. The post-anther lobe of the column is tubular, variously inflated, smooth on the dorsal surface, variously open on the ventral side, and entire, emarginate or deeply bifid at the apex. The auxiliary lobes are at most rudimentary, consisting of a pair of tiny incurved spurs on the lower apical margin of the post-anther lobe, or more often completely absent. The two finger-like lateral lobes extend forward from the column wing, one on each side of the anther and just below the post-anther lobe. These may be more or less straight, curved gently or bent upwards at right angles near the middle. Each lateral lobe has a tuft of white trichomes (less often yellow or mauve) that may be elongate (resembling a toothbrush) or short and more or less terminal (resembling a mop).

In my revision (Jeanes 2004) I stated “It is likely that other taxa worthy of recognition exist within this large and diverse complex, but adequate information and collections of these are lacking at present”. These portentous words were realized when I discovered *T. reflexa* within months of submission of the manuscript.

Taxonomy

A key to the *T. pauciflora* complex in Australia was published recently (Jeanes 2004). To include *T. reflexa* in this key, modify couplet 22 and add couplet 22a as follows.

- 22. Tepals reflexing strongly back towards the ovary, particularly at air temperatures of 30 degrees Celsius or more; post-anther lobe uniformly dark blackish green throughout*T. reflexa*
- 22. Tepals spreading at about right angles to the ovary, but never reflexing strongly even on the hottest days; post-anther lobe usually bicolorous 22a
- 22a. Flowers usually 1–3, most often pale blue; lateral lobes 0.5–1 mm long, bent sharply upwards at c. 90° near the middle; post-anther lobe entire or emarginate*T. pauciflora*
- 22a. Flowers usually 4–10, most often mauve or deep purplish blue; lateral lobes 1.2–1.5 mm long, curved gently upwards; post-anther lobe often deeply bilobed at the apex 23



Figure 1. *Thelymitra reflexa*: Crib Point, Victoria (photograph by J.A.Jeanes)

Thelymitra reflexa Jeanes, sp. nov.

T. pauciflorae R.Br. affinis sed plantis robustioribus plerumque, floribus pluribus, periantho aperiendi late plus, tepalis reflexis appressis in ovario per caelum calidum, et lobo post-anthera columnae atrovirenti omnino differt.

Type: Victoria. Crib Point, Mornington Peninsula, 15 xi. 2003, J.A. Jeanes 1271 (holotype MEL; isotypes CANB, AD).

Glabrous terrestrial herb. Tubers not seen. Leaf linear to linear-lanceolate, 10–25 cm long, 3–10 mm wide, erect, canaliculate, fleshy, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acute to acuminate. Inflorescence 17–45 cm tall, 0.7–2 mm diam., slender, straight, purplish. Sterile bracts usually 2, occasionally 3, linear to linear-lanceolate, 1.5–6 cm long, 3–7 mm wide, closely sheathing, acute to acuminate, green to purplish. Fertile bracts ovate-acuminate to obovate-acuminate, 4–13 mm long, 3–6 mm wide, sheathing the pedicels, green to purplish. Pedicels 0.5–12 mm long, slender. Ovary narrow-obovoid, 5–15 mm long, 1.5–3.5 mm wide. Flowers 1–6, 14–20 mm across, usually bluish purple, opening only on very hot days with the perianth reflexing strongly. Perianth segments 5–10 mm long, 2.5–5 mm wide, concave, often shortly apiculate; dorsal sepal ovate, obtuse to subacute; lateral sepals lanceolate to ovate, often slightly asymmetric, acute; petals ovate to obovate, obtuse to subacute; labellum obovate to oblanceolate, acute, often slightly smaller than other segments. Column erect from the end of ovary, 4–5.5 mm long, 2–3 mm wide, pink or purplish; post-anther lobe hooding the anther, 1.8–2.5 mm long, 1.3–2 mm wide, tubular, often somewhat compressed dorsally, open or closed on the ventral side, curving through c. 90°, dark blackish green throughout, apex usually deeply bilobed, the lobes 0.5–1 mm long, margins thickened and recurved; post-anther lobe extension 0.4–0.7 mm; auxiliary lobes absent or present as 2 tiny triangular, incurved spurs on the lower apical margin of the post-anther lobe; lateral lobes converging or more or less parallel, 1–1.4 mm long, digitiform, porrect at base, curving upwards, each with a sub-terminal, mop-like, tuft of trichomes that embrace the apex of post-anther lobe, the individual trichomes 0.6–1 mm long, white, rarely pink. Anther inserted above centre of column, ovoid, 1.8–2.3 mm long, 1.3–1.6 mm wide, the connective produced into an apical beak 0.5–0.7 mm long; pollinarium 1.3–1.8 mm long; viscidium more or less circular, c. 0.5 mm diam.; pollinia mealy, friable, white. Stigma situated at base of column, ovate-quadrate, 1.5–2.2 mm long, 1.2–2 mm wide, margins irregular. Capsules obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Figs 1 & 2)

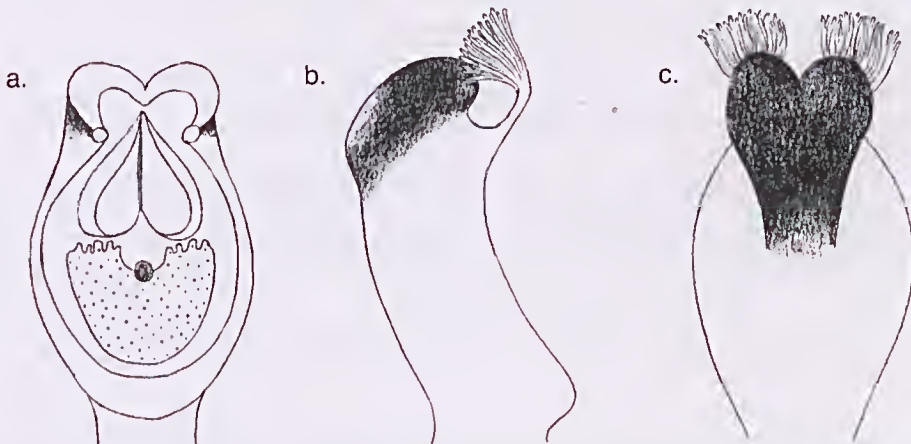


Figure 2. *Thelymitra reflexa*: a column from front (lateral lobes removed) x10; b column from side x10; c column from rear x10

Specimens examined: VICTORIA: Stony Point railway, 12 x. 2004, J.A. Jeanes 1434 (MEL 2209217 & MEL 2209218).

Distribution and habitat: Currently known with certainty only from the type locality at Crib Point, nearby Stony Point and on French Island (photographs only) in south-central Victoria. Grows in near-coastal heathy woodland on seasonally damp sandy loams. Probably more widespread than current records suggest and should be looked for in similar habitats in areas such as Anglesea, French Island and Wilsons Promontory. Altitude: 1–5 m.

Conservation status: Poorly known. Suggest 2K by criteria of Briggs & Leigh (1996), and Data Deficient (DD) by criteria of IUCN (1994).

Flowering period: Early October to late November.

Pollination biology: This species is facultatively autogamous.

Notes: *Thelymitra reflexa* is probably most closely related to *T. pauciflora* and *T. peniculata* Jeanes with which it shares a slender habit, long narrow leaf and terminal hair tufts on the lateral lobes of the column. It differs from *T. pauciflora* in often having more flowers (up to six) and from *T. peniculata* in being less robust and usually having fewer, slightly smaller more bluish flowers. It differs from both the above species in having flowers in which the perianth segments reflex strongly against the ovary on hot days (of 30 degrees Celsius or more) and its entirely blackish green post-anther lobe on the column.

Thelymitra reflexa grows sympatrically with many other *Thelymitra* species and has been observed flowering synchronously with at least 12 other taxa. On hot days it is the only species in the area to display the characteristic reflexed tepals, and this feature is consistent throughout the population. The only other *Thelymitra* species observed by the author to have comparably reflexed tepals is the unrelated and allopatric *Thelymitra luteociliatum* Fitzg., but this feature is rare for that species and is not consistent throughout a population at any given time.

Etymology: Latin *reflexus*, bent back; although the flowers of this species are reluctant to open except on the hottest of days, when they do so the tepals reflex back against the ovary more than in any other species in the *T. pauciflora* complex.

Acknowledgments

I am grateful to my colleague Neville Walsh (MEL), who kindly wrote the Latin diagnosis and made helpful comments on the text. My appreciation also goes to Enid Mayfield (MEL) for executing the line drawings, and to the two anonymous referees for their constructive comments on the manuscript.

References

- Briggs, J.D. & Leigh, J.H. (1996). *Rare or threatened Australian plants* (revised edition). CSIRO Publishing: Collingwood.
- IUCN (1994). *IUCN Red List Categories*, International Union for Conservation of Nature and Natural Resources. Gland, Switzerland.
- Jeanes, J.A. (2004). A revision of the *Thelymitra pauciflora* R.Br. (Orchidaceae) complex in Australia. *Muelleria* 19, 19–79.

Two ephemeral species of the lichen genus *Absconditella* (Stictidaceae) new to Tasmania

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Abstract

The lichen genus *Absconditella* Vězda is recorded from Tasmania for the first time. It is represented by two very inconspicuous species, *A. delutula* and *A. lignicola*, which occur in regenerating wet forest logging coupes. These species are described briefly and illustrated, and the features that distinguish them from related or superficially similar genera are noted.

Introduction

Lichens are frequently associated with extreme longevity and slow growth, features that make them useful in dating biogeographical and archaeological features (see Nash 1996). However, not all lichen species are long-lived, as demonstrated by the ability of many to colonise relatively short-lived substrata such as living leaves. Poelt & Vězda (1990) discussed a suite of temperate European species they termed 'kurzlebige Flechten' (short-living lichens) that complete the cycle from diaspore to fertile thallus to diaspore in a very short time, often just a few months. These lichens are typically associated with habitats where competition from other organisms is relatively low and the substratum is rather unstable.

An ongoing study of lichen recolonisation following logging and regeneration in wet eucalypt forest in southern Tasmania has revealed that so-called short-living lichens are represented in the process of forest re-establishment (G. Kantvilas & J. Jarman, unpublished data). Within about a year of regeneration treatment (typically burning), one of the earliest colonisers of muddy soil is the lichen *Steinia geophana* (Nyl.) B. Stein (Kantvilas 2004). Approximately three years after treatment, the recolonising flora includes species of *Absconditella*, a lichen genus not recorded previously from Tasmania. A brief account of these collections is presented here.

Methods

Morphology was studied via low-power microscopy. Anatomy was examined by high-power light microscopy, using hand-cut sections mounted in water, 15% KOH and Lugol's iodine after pretreatment with dilute KOH (referred to in text as K/I). Tasmanian collections were compared with herbarium material housed in HO (listed below).

Comparative material examined:

Absconditella delutula (Nyl.) Coppins & Kilius: Austria: Steiermark, Koralpe, Stainz, in valle "Mausegger Graben", 5.vii.1992, H. Pittou et al. (A. Vězda: Lieh. Rar. Exsicc. 41) (HO).

Absconditella lignicola Vězda & Pišút: Czech Republic: Bohemia, montes Sumava, reservatum naturae Stoecká, 13.viii.1995, Z. Palice (A. Vězda: Lieh. Rar. Exsicc. 191) (HO).

Bryophagus gloeocapsa Nitschke ex Arnold: Germany: Bavaria, Haidmühle, Mount Dreisselberg, 18.x.1998, A. Vězda et al. (A. Vězda: Lieh. Rar. Exsicc. 371) (HO).

Bryophagus minutissima (Vězda) D.L. Hawksw.: Tasmania: Queenstown, 42°05'S 145°33'E, 6.ii.1984, P. James & G. Kantvilas 191/84 (BM, herb. Vězda, HO).

Coenogonium lutescens (Vězda & Malcolm) Malcolm: Tasmania: West of Tahune Bridge in the Warra SST, 'Big Coupe', 43°06'S 146° 41'E, 19.v.1999, *J. Jarman s.n.* (herb. Vězda, HO).

Dimerella piueti (Schr.) Vězda: Poland: Pomerania, Stowinski National Park, 18.v.1995, *J. Miadlikowska* (A. Vězda; Lieh. Rar. Exsicc. 198) (HO).

Gyalidea hyalinescens (Nyl.) Vězda: Tasmania: West of Tahune Bridge in the Warra SST, 'Top Coupe', 43°06'S 146° 41'E, 4.vi.2003, *G. Kantvilas* 468/03 (HO).

Gyalidea lecideopsis (A. Massal.) Lettau ex Vězda: Austria: Steiermark, Fischbacher Alpen, 27.v.1990, *J. Poelt* (HO).

The species

The genus *Absconditella* (family Stictidaceae) was erected by Vězda (1965) and currently comprises nine species that are comprehensively treated by Bielezyk & Kiszka (2001). The genus is characterised by an effuse, crustose thallus, chlorococcoid photobiont, tiny, pale-coloured, urceolate to conecave apothecia, simple or occasionally branched paraphyses with typically swollen apices, eight-spored asei with a distinct, non-amyloid apical dome, and fusiform to ellipsoid, mostly 1–3-septate, colourless spores (Fig. 1; see also Coppins 1992). Species of *Absconditella* are extremely inconspicuous and easily overlooked. Indeed, all collections cited in this study were made fortuitously, and were detected only in the laboratory at low power magnification. They occurred on soil or wood fragments collected for other purposes, commonly associated with a thin algal film or intermixed with other lichens.

Several other genera are superficially similar to *Absconditella* and can be distinguished from each other only by careful anatomical study. In the Tasmanian lichen flora, these include *Bryophagus* Nitschke ex Arnold, *Coenogonium* Ehrenb. (including *Dimerella* Trevisan) and *Gyalidea* Lettau, which are characterised mainly by a combination of photobiont type and the structure of the ascus and paraphyses (Bielezyk & Kiszka 2001; Kantvilas 2002). The salient features of these genera are summarised in Table 1.

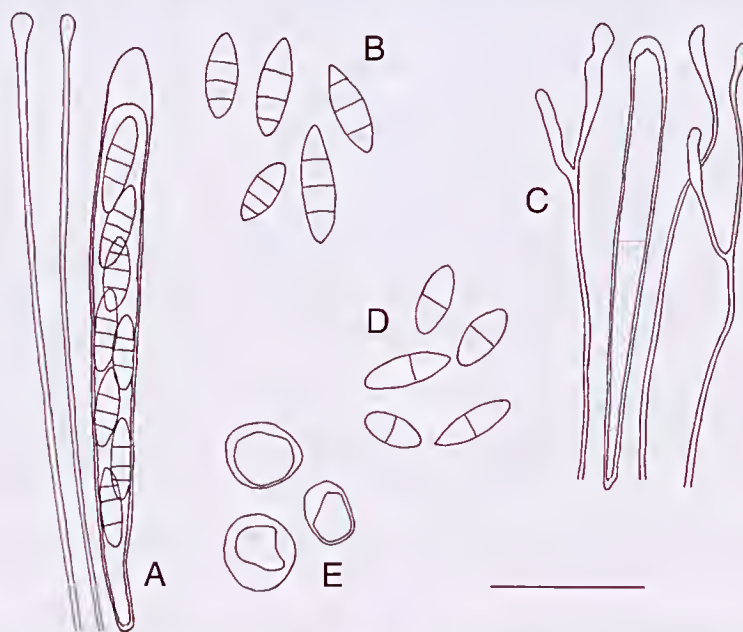


Figure 1. Anatomy of *Absconditella* species. A. *lignicola* (HO 526237): A- asei, spores and paraphyses; B- spores. A. *delutula* (HO 41035): C- young ascus and paraphyses; D- spores; E- photobiont cells. Scale= 20 µm.

Table 1: Comparison of major characters in *Absconditella* and superficially similar genera.

	photobiont	hymenium	ascus	paraphyses	spores
<i>Absconditella</i>	chlorococcoid, cells ± globose	K/I- or very weakly reddish brown	narrowly cylindrical with thickened apex; all parts K/I-	±simple, indistinctly septate, with expanded apices	ellipsoid to fusiform, transversely septate
<i>Bryophagus</i>	<i>Gloeocystis</i> (colonies of ±globose cells in a gelatinous sheath)	K/I+ blue	narrowly cylindrical with thickened apex; wall K/I+ blue	simple, straight, non-septate; apices not expanded	bacilliform to fusiform, transversely septate
<i>Coenogonium</i>	<i>Trentepohlia</i> (cells in short filaments)	K/I+ blue	narrowly cylindrical with K/I+ blue wall; apex not prominently thickened	sparsely branched with swollen, distinctly septate, ± moniliform apices	ellipsoid, 1-septate
<i>Gyalidea</i>	chlorococcoid, cells ± globose	K/I+ reddish brown	with thickened, K/I- apex; ascoplasm truncate to concave at the apex, K/I+ reddish brown	simple, septate, with unexpanded apices	ellipsoid, transversely septate or muriform, slightly constricted at the septa, sometimes with a gelatinous perispore

Absconditella delutula (Nyl.) Coppins & Kiliyas, *Lichenologist* 12: 106 (1980)
= *Absconditella modesta* (Hegetschw.) Vězda, *Preslia* 37: 243 (1965).

This species has the following diagnostic characteristics: thallus effuse, very thin, greenish and rather glossy, with photobiont cells irregularly roundish, 7-15 µm diam.; apothecia minute, scattered, initially rather sunken but soon superficial, 0.07-0.15 mm wide, with a plane to concave, pale brownish disc and whitish, persistent proper margin; paraphyses entangled but predominantly simple or only sparingly branched, 0.7-1 µm thick, with apices unpigmented, irregularly swollen to 1-3.5 µm thick; ascospores ellipsoid, 1-septate, 8-12 x 3-5 µm (Figs 1 C-E, 2). A full description is provided by Bielezyk & Kiszka (2001). Tasmanian material has somewhat smaller spores than reported by these authors, but nevertheless compares favourably with reference material from Europe. Furthermore, in the Tasmanian specimens, the hymenium is only very weakly K/I+ reddish brown.

This species was found on rotting wood and on consolidated soil in a regenerating logging coupe that was originally *Eucalyptus obliqua* L'Hérit.-dominated wet forest. The thallus forms a glossy, greenish, film-like seum over the substratum, associated with and in places growing amongst the thallus granules of *Placythiella icmalea* (Aeh.) Coppins & P. James. This species is very closely related to *A. lignicola* (see below) which differs only by its 3-septate spores. Within the Tasmanian lichen flora, it is very similar to *Coenogonium lutescens*, which inhabits similar habitats in unlogged forest but is distinguished by a suite of anatomical characters (Table 1).

Absconditella delutula is widespread in the cool temperate latitudes of Europe (see Bielezyk & Kiszka 2001), and was first recorded for the Southern Hemisphere from Queensland by Hafellner *et al.* (1989) (as *A. modesta*). This is the only mainland Australian record for the species.

Specimens examined: Tasmania: West of Tahune Bridge in the Warra SST, 'Top Coupe', 43°06'S 146°41'E, 200 m altitude, 27.iii.2002, *J. Jarman s.n.* (HO 41035); *ibid.*, 4.vi.2003, *J. Jarman s.n.* (HO 526206); *ibid.*, 'Big Coupe', 180 m altitude, 25.v.2004, *J. Jarman s.n.* (HO 526778).

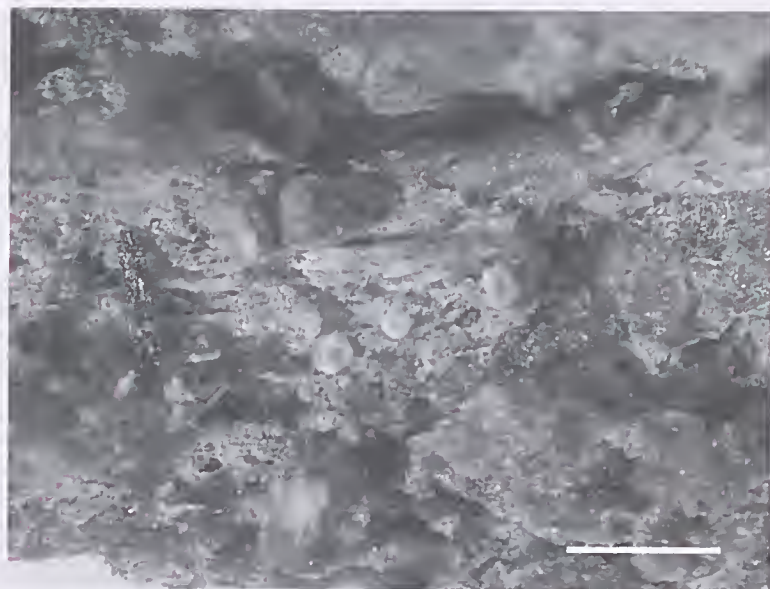


Figure 2. Habit of *Absconditella delutula*, showing minute apothecia (HO 56206). Scale = 0.5 mm.

Absconditella lignicola Vězda & Pišút, *Nova Hedwigia* 40: 344 (1984)

This species has the following diagnostic characteristics: thallus crustose, effuse, sometimes rather granular or goniocyst-like, with photobiont cells irregularly roundish, 12-28 μm diam.; apothecia minute, scattered, superficial, rather urceolate, 0.1-0.15 mm wide, with a plane to concave, pale brownish disc and whitish, persistent proper margin; paraphyses straight, simple, 0.7-1 μm thick, with apices unpigmented, irregularly swollen to 2 μm thick; ascospores fusiform-ellipsoid, 3-septate, 8-15 x 3-5 μm (Figs 1 A-B). Further descriptions are provided by Bielezyk & Kiszka (2001) and Vězda & Pišút (1984); the latter authors also illustrate this taxon. Tasmanian specimens correspond closely to European material except that occasionally the asci are longer [up to 80 μm long compared to 40-50 μm as cited by Bielezyk and Kiszka (2001)].

Like *A. delutula*, *A. lignicola* has been collected on consolidated soil and rotting wood in a regenerating logging coupe that once supported *Encalyptus obliqua* wet forest. It was also found in the unlogged forest on soil and the rotting leaf bases of the large rosette sedge, *Gahnia grandis* (Labill.) S.T. Blake. Further collections are from buttongrass (*Gymnoschoenus*) moorland, where it grew on the underside of a loose clod of peaty soil, and from a roadside eucalypt stump in rainforest, associated with *Micarea micrococca* (Körber) H. Gams. The species is distinguished from *A. delutula* by its 3-septate spores.

Absconditella lignicola is widespread in cool temperate areas of Europe and has also been recorded from Siberia and North America (Bielezyk & Kiszka 2001). This is the first report of the species from the Southern Hemisphere.

Specimens examined: Tasmania: West of Tahune Bridge in the Warra SST, 'Middle Coupe', 43°06'S 146°42'E, 100 m altitude, 30.vii.1998, *J. Jarman s.n.* (HO 502948); West of Tahune Bridge in the Warra SST, 'Big Coupe', 43°06'S 146° 41'E, 120 m altitude, 30.xi.1998, *G. Kantvilas* 251/98 (HO); West of Tahune Bridge in the Warra SST, 'Top Coupe', 43°06'S 146°41'E, 200 m altitude, 4.vi.2003, *J. Jarman s.n.* (HO 526237); at foot of Hamilton Moraine, 41°59'S 145°34'E, 600 m altitude, *G. Kantvilas* 197/98 p.p. (HO); Western Explorer Road, 41°22'S 145°02'E, 380 m altitude, 14.x.2003, *G. Kantvilas* 571/03B (HO).

Acknowledgements

I thank Jean Jarman for preparation of the Figures and drawing my attention to several unusual collections.

References

- Bielezyk, U. and Kiszka, J. (2001). The genus *Absconditella* (Stictidaceae, Ascomycota Lichenisati) in Poland. *Polish Botanical Journal* **46**, 175-181.
- Coppins, B.J. (1992). '*Absconditella* Vězda (1965)', in O.W. Purvis, B.J. Coppins, D.L. Hawksworth, P.W. James and D.M. Moore (eds), *The Lichen Flora of Great Britain and Ireland*, pp 57-58. Natural History Museum Publications: London.
- Hafellner, J., Filson, R.B. and Rogers, R.W. (1989). Some genera and species of lichenized fungi new to Australia. *Nova Hedwigia* **48**, 229-235.
- Kantvilas, G. (2002). *Agyrium* Fr., *Bryophagus* Nitschke ex Arnold and *Racodimm* Fr., lichen genera previously unrecorded for Australia. *Muelleria* **16**, 65-70.
- Kantvilas, G. (2004). Aphanopsidaceae. *Flora of Australia* **56A**, 1-3.
- Nash, T.H. (1996). *Lichen Biology*. Cambridge University Press: Cambridge.
- Poelt, J. and Vězda, A. (1990). Über kurzlebige Flechten (On shortliving lichens). *Bibliotheca Lichenologica* **38**, 377-394.
- Vězda, A. (1965). Flechtensystematische Studien II. *Absconditella*, eine neue Flechtengattung. *Preslia* **37**, 237-245.
- Vězda, A. and Pišút, I. (1984) Zwei neue Arten der Flechtengattung *Absconditella* (lichenisierte Stictidaceae, Ostropales) in der Tschechoslowakei. *Nova Hedwigia* **40**, 341-346.

A new species of *Isopogon* (Proteaceae) from southwest Western Australia

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Abstract

Isopogon robustus Foreman ex N.Gibson *sp. nov.* is described, with notes on its affinities, distribution and conservation status.

Introduction

During botanical surveys of the Parker Range in southwest Western Australia in October 1994 a specimen of *Isopogon* was collected (Fig. 1) that did not fit circumscriptions of taxa listed in the recent revision of the genus (Foreman 1995). The collection was forwarded to Don Foreman who confirmed its status as a new taxon and suggested the epithet. Don's untimely death intervened before he was able to publish this new species.

Taxonomy

Isopogon robustus Foreman ex N.Gibson, *sp. nov.*

Isopogoni scabrinscula subsp. *pubflori* Foreman affinis sed floribus longioribus (ad 25 mm longis), foliis crassioribus (ad 3.3 mm dia.); ad aliis subspeciebus *Isopogonis scabrinscula* Meisn. tubo perianthii pubescenti differt.

Type: Parker Range, Western Australia [precise locality withheld], 10 x 1996, N. Gibson 2513 (holotype PERTH 04701917, isotypes CANB, MEL).

Shrub to 1.5 m high and to 2 m diameter. *Branchlets* red-brown to grey-brown, minutely pubescent. *Leaves* simple; petiole not distinct; lamina terete, to 15 cm long and 2.5 to 3.3 mm diameter, pungent, minutely scabrous, minutely sericeous, becoming glabrescent. *Inflorescence* terminal, sessile, solitary, obovoid to 38 mm diameter, surrounded by leaves; involucre bracts broad, ovate, imbricate, tomentose outside, persistent, becoming hard after flowering; cone scales narrower, densely tomentose outside with orange hairs, usually glabrous toward apex. *Flowers* 19–25 mm long, pink; perianth tube pubescent, with a tuft of hairs on apex of each tepal. Pollen presenter 2.6–4.5 mm long; basal part papillose, 4-angled, swollen at base, constricted near mid-point then dilated and globose; apical part glabrous, swollen near its base then tapering slightly to stigmatic cup. *Cones* globose, 19–24 mm diameter. *Nuts* ovoid, beaked, 2.8–3.7 mm long, villous, hairs yellow.

Additional specimens examined: WESTERN AUSTRALIA: Parker Range, [precise locality withheld], 16th October 1994, N. Gibson & M. Lyons 2077 (PERTH); Parker Range, [precise locality withheld], 14th December 2001, K. Bettink 35 (PERTH).

Distribution: Known from a single population of c. 120 plants at the type location in the Parker Range, c. 50 km SE of Southern Cross.

Habitat: Occurs on an eroding laterite shelf, with a skeletal grey sandy-loam soil.

Flowering period: October.

Conservation status: Listed as Declared Rare Flora under Western Australian



Figure 1. The type of *Isopogon robustus* showing terminal inflorescences on annual branches. Scale bar 10 cm.

Table 1. Characters distinguishing *Isopogon robustus* from the subspecies of *Isopogon scabriusculus*. Leaf width measured half way between base and tip.

	<i>Isopogon scabriusculus</i> subsp. <i>scabriusculus</i>	<i>Isopogon scabriusculus</i> subsp. <i>stenophyllus</i>	<i>Isopogon scabriusculus</i> subsp. <i>pubifloris</i>	<i>Isopogon robustus</i>
Leaf type	simple or lobed	simple	simple	simple
Leaf cross-section	flat	terete	terete	terete
Leaf width	2.1-3.8 mm	1.2-2.5 mm	1.2-2.5 mm	2.5-3.3 mm
Flower length	12-15 mm	9-15 mm	11-16 mm	19-25 mm
Perianth tube pubescent	no	no	yes	yes

legislation. Meets criteria for listing as Critically Endangered under IUCN guidelines (IUCN 2001). Precise location details withheld for conservation reasons. The population occurs in an area under threat from exploration and mining activity (Gibson & Lyons 1998).

Etymology: The specific epithet is from the Latin word *robustus* (robust), referring to the thick leaves and large flowers of this species.

Notes: The new species is most closely related to *Isopogon scabriusculus* Meisn. but differs in having longer flowers and thicker terete leaves (Table 1). Of the three subspecies of *I. scabriusculus* the new taxon is most similar to *I. scabriusculus* subsp. *pubifloris* Foreman that also has a pubescent perianth tube.

Acknowledgements

Paul Wilson kindly provided encouragement and the latin diagnosis.

Reference

- Foreman, D.B. (1995). *Isopogon*, *Flora of Australia* **16**, 194–223.
 Gibson, N. and Lyons, M.N. (1998). Flora and vegetation of the Eastern Goldfields Ranges: Part 3. Parker Range. *Journal of the Royal Society of Western Australia* **81**, 119–129.
 IUCN (2001). *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Switzerland and Cambridge, UK.

Callistemon nyallingensis (Myrtaceae) a new species from East Gippsland, Victoria

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Abstract

Callistemon nyallingensis Molyneux is described and illustrated. It is a narrow endemic apparently confined to Boggy Creek at Nowa Nowa, in East Gippsland in southern Victoria. Its habitat, conservation status and relationship with *Callistemon subulatus* are discussed.

Introduction

A new rheophytic chasmophyte species of *Callistemon* has been distinguished from *C. subulatus* Cheel, under which species it was included by Willis 1973, p 451 and Costermans 1981, p 244, by map location. No herbarium specimens prior to the author's 1996 collection (cited below) could be found at MEL, which was surprising considering the Willis reference.

Taxonomy

Callistemon nyallingensis Molyneux sp. nov.

Callistemoni subulato affinis sed foliis late linearibus, sparsiis et plerumque irregulariter dispositis, floribus purpureo-rubris, capsulis persistentibus tarde dehiscentibus differt.

Type: Cultivated at the author's property, Dixons Creek, Victoria, Australia; 10.xii.2003, from seed and cutting material collected in 1996 by the author from plants on the west bank of Boggy Creek, thirty metres upstream from the old railway bridge, east of Nowa Nowa. (holotype: MEL; isotypes: CANB, NSW, BRI).

Shrub, small, upright, 0.65–1.2 m tall, 0.6–1 m wide, single or few stemmed, new growth sericeous greyed-red (RHS 178B), soon becoming glabrous. *Bark* tight papery grey. *Leaves* open to moderately dense, often irregularly aligned, and sometimes appearing sub-secund in arrangement, spreading at c. 20–30° to stems. Petioles variously twisted or straight, lamina flexible becoming coriaceous, broadly linear to lanceolate, often asymmetrical, strongly mucronate, green RHS 143A, (25–) 30–40 (–58) mm long, 3–4 (–6) mm wide; midvein strongly raised on upper surface, indented, level, or slightly raised on lower surface, margins thickened, secondary intramarginal veins evident. Oil glands obvious and of medium density on both surfaces, secondary venation not evident. Crushed leaves release a low level “eucalyptus” like odour. *Conflorescence* usually distally frondose on main stems, or less often on short side stems, horizontal to ascending or pendulous, 36–140 flowered, 70–125 mm long, 40–46 mm wide, new leaf growth often interrupting distal end of flowers, rhachis glabrous or sparsely villous where perigynium attaches. Perigynium glabrous, c. 7 mm long, 4 mm wide. *Flowers* openly arranged on rhachis. Bracts chaffy, ovate-subulate to subulate with suffused pink-red markings, glabrous excepting for scattered hairs at the base on dorsal side, strongly ventrally concave, 11–13 mm long, 2.5–4.5 mm wide, deciduous at early bud development. Sepals rounded to rhomboidal, 2 mm long, 2.2 mm wide, glabrous, margins lightly ciliate. Petals c. 4 mm long, 3.5 mm wide, green, strongly concave, margins weakly ciliate. Stamens 24–26 per flower, 9–12 mm long, purple-red (RHS 53B), anthers purple (RHS 77A), ovary hoary, obscured c. 1.8 mm across, and 0.5–0.75 mm below rim.

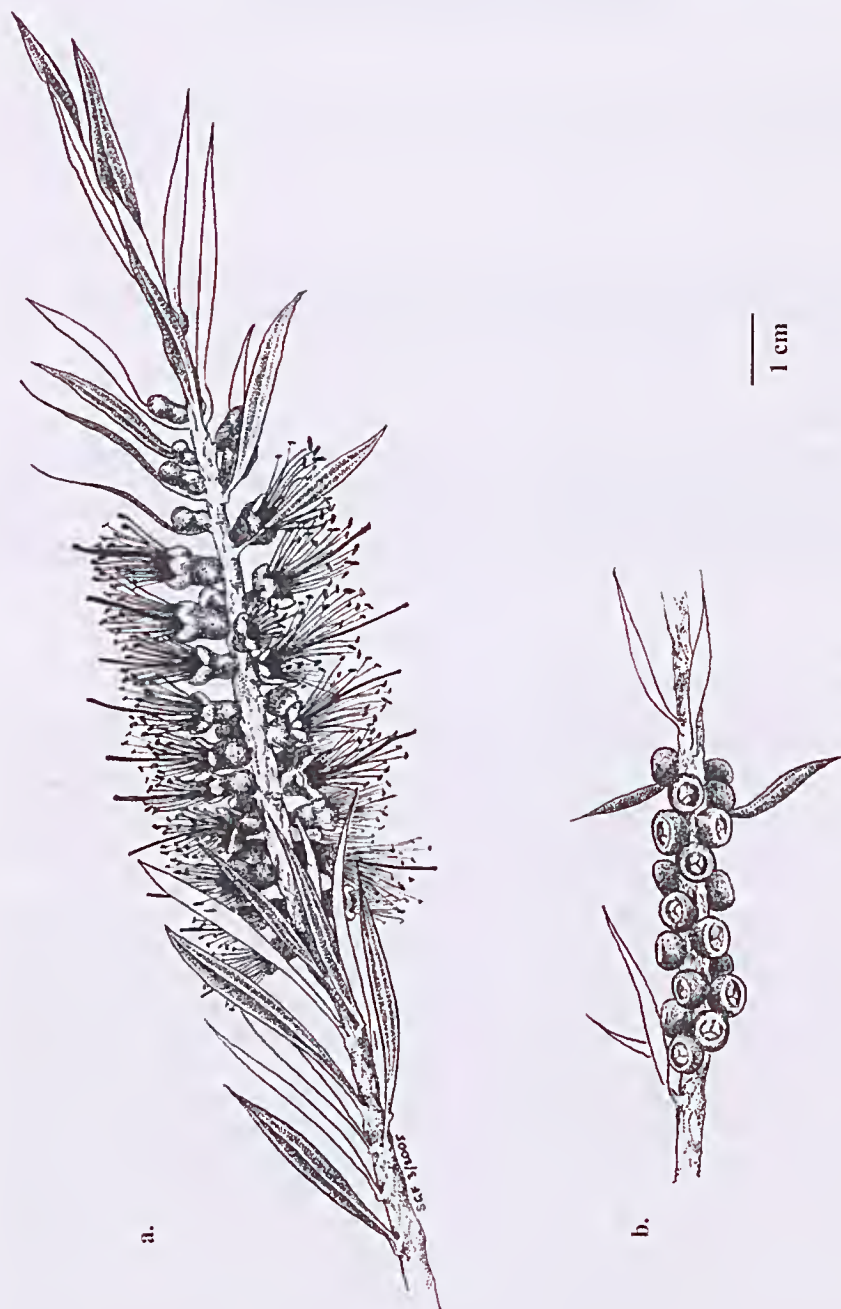


Figure 1. *Callistemon nyallingensis* a. conflorescence and leaf detail (x1) b. seed capsule at 3 years (x1)

Style gently curving over its length or nearly straight, mostly much longer than stamens, purple-red (RHS 53B), 12–18 mm long, narrowed behind the shallowly domed style end. Capsules squat, 3.5–4 mm long, c. 4.5–5.5 mm wide, orifice 2.5–3 mm wide, ovary set 1–1.5 mm below rim, retained for many years, not dehiscing early, openly arranged or touching.

Recommended vernacular: Boggy Creek Bottlebrush.

Specimens examined: **VICTORIA**: Boggy Creek, west bank c. 30 metres upstream from railway trestle bridge, 2.xii.1996, W.M. Molyneux (MEL 2041778), and same location 30.xi.1997, W. M. Molyneux (MEL 2237174) (NatMap 1982). Boggy Creek c. 300 metres downstream from Nowa Nowa Pumping Station, 4.v.2004, W.M. Molyneux and S.G. Forrester (MEL 2237173).

Habitat and major plant associations: *Callistemon nyallingensis* is a rheophytic chasmophyte apparently confined to the Boggy Creek Gorge adjacent to and upstream of the township of Nowa Nowa in East Gippsland, Victoria. It is found on rock bars in the creek, often on nearly vertical faces, which are derived from Devonian acid volcanics.

The species is extensively sympatric with *Callistemon pallidus*, *Tristaniopsis laurina* and *Calytrix tetragona*, and less often with *Melaleuca ericifolia*. *Encalyptus viminalis* is the dominant tree on the lower moist slopes, while *E. sieberi* and *E. globoidea* are the major trees together with *Acacia silvestris* and *Philotheca trachyphylla* in drier sclerophyll woodlands.

Etymology: The epithet is derived from the Kurnai Nation, and is the Tatungalung tribal name for a boggy place. The name Boggy Creek was applied by surveyor and explorer Angus McMillan.

Discussion

Callistemon nyallingensis, while readily distinguishable from Victorian and southern New South Wales populations of *C. subulatus*, may be confused with Cheel's type from the Nattai River. While the range of leaf length and width in most *C. subulatus* populations falls within the lower end of the range of *C. nyallingensis* (a Shoalhaven area collection is intermediate between the two, L. Craven pers. comm.), the leaves of the type specimen of *C. subulatus* are about 30–60 mm long and 3–4 mm wide, in contrast to those of *C. nyallingensis* which are 25–58 mm long, and 3–6 mm wide. Other specimens collected from plants grown from seed, collected by Cheel from the type area, exhibit foliage size and arrangement more in accord with other populations of *C. subulatus*. Cheel's type collection of *C. subulatus* has the larger leaves less regularly aligned than both southern New South Wales and Victorian populations of the species. It may be that Cheel selected lush new growth for his type. It is obvious, however, that his type is not representative of the general range of leaf size for the species.

In Molyneux (1993) it was stated that *C. subulatus* did not occur further west than Cann River, and that a Willis (1973) reference to *C. subulatus* as "a riparian shrub ± 4 feet high from Nowa Nowa eastwards" was a possible anomaly. At that time the author was not aware of the presence of *C. nyallingensis* at Boggy Creek, Nowa Nowa, which had apparently been mistaken by Willis for *C. subulatus*. In Molyneux (1997), I admitted my oversight and provided some characters that differentiated *C. subulatus* from *C. nyallingensis*, indicating the presence of this new taxon at Boggy Creek.

Correction and addition: Specimens named as *Callistemon sieberi* from Boggy Creek, examined by the author at MEL, are in fact *Callistemon pallidus*, which is often sympatric with *C. nyallingensis*. *Callistemon citrinus* grows in the region but in higher boggy sites to the east in the catchment of Ironstone Creek. During examination of the upper Boggy Creek area about two hundred metres below the pumping station on 5 May 2004, the author collected an apparently undescribed mauve-flowered *Callistemon* with affinities to *C. pallidus*.

Distribution and conservation status: *Callistemon nyallingensis* is presently known only from the gorge section of Boggy Creek in East Gippsland, Victoria. The author has collected the species over a distance of c. 4.8 km from c. 300 metres below the pumping station downstream to a point just above the old railway trestle bridge. This southern limit is in close proximity to the township of Nowa Nowa and only several hundred metres upstream of where Boggy Creek becomes tidal. The estimated area of occupancy of *C. nyallingensis* is ± 10 ha over a length of approximately 4.8 km and an average width of 20 m. Estimated population size is 800–1000 plants almost all of which are protected within the Lake Tyers State Park. On present evidence the species should be regarded as vulnerable, with a ROTAP risk code (Briggs and Leigh 1996) of 2VCi and IUCN (2001) risk code of VU D1+2.

Table of comparison between *C. nyallingensis* and *C. subulatus*

Character	<i>C. nyallingensis</i>	<i>C. subulatus</i>
Habit	A mostly upright narrow shrub, single-stemmed; 0.65–1.2 m high, 0.6–1 m wide (one specimen 1.5 m high, 2.5 m wide)	Arching spreading shrub often multi-stemmed; 0.9–1.8 m high, 1.2 (–2.2) m wide
Leaves	Broad linear to lanceolate, thickish texture, open to moderately densely arranged, irregularly aligned, often appearing sub-secund to stems (25–) 30–40 (–58) mm long, 3–4 (–6) mm wide. Colour RHS 143A Green Group	Linear subulate, thin textured, dense $\pm$ regularly aligned around stems (20–) 26–32 (–60) mm long, (1.5–) 2–2.5 (–4) mm wide. Colour RHS 137C Green Group
Leaf density	Number of leaves in upper 30 cm of stems ± 86 , and 35 in lower 30 cm of stems	Number of leaves in upper 30 cm of stems ± 150 , and 65 in lower 30 cm of stems
Leaf venation	Upper surface midvein strongly raised, lower surface midvein indented to slightly raised. Secondary intramarginal veins evident, leaf margins thickened	Upper surface midvein obscure, lower surface midvein obvious, indented. Secondary intramarginal longitudinal veins venation obscure, margins not thickened
Conflorescence	Flowers openly arranged on rhachis, which is glabrous excepting for a few scattered hairs; perigynium glabrous, longer than wide, 70–125 mm long, 40–46 mm wide	Flowers densely arranged on rhachis, which is nearly glabrous or villous in some populations (eg. Lower Wigan River–Tonghi Creek) often as wide as long, 40–80 mm long, 45–50 mm wide
Floral bracts	Ovate-subulate to subulate, 11–13 mm long, 2.5–4.5 mm wide.	Narrow, linear, subulate, 10–12 mm long, 0.8–1.2 mm wide
Stamens	9–12 mm long, 24–26 per flower	14–22 mm long, 18–20 per flower
Style	12–17 mm long, purple-red RHS 53B	15–22 (–25) mm long, crimson RHS 45A
Flowering	Late November to early January, no apparent second phase	Late October to mid December, often again in autumn–early winter
Capsules	Openly spaced to touching, 4.5–5.5 mm across, only dehiscing after many years	Touching to crowded, 3–4 (–5) mm across, often dehiscing early.

All colour coding 1986 edition RHS swatch.

Acknowledgements

To the Royal Botanic Gardens Melbourne for staff support and access to collections, Neville Medhurst of Toorloo Arm for information on population numbers, Lyn Craven for discussions on variation within *C. subulatus*, David Cameron for comments on the draft of this paper and editorial assistance, Neville Walsh for Latin diagnosis from my English draft, and Sue Forrester for collating the manuscript and supplying the illustration.

References

- Briggs, J.D. & Leigh, J.H. (1996). *Rare or Threatened Australian Plants*, Revised Edition. CSIRO and Australian Nature Conservancy Agency, Canberra.
- Cheel, E. (1925). Two new species of *Callistemon*, with notes on certain other species. *Proceedings of the Linnaean Society of New South Wales*, 1: 259–266.
- Costermans, L.F. (1981). *Native Trees and Shrubs of South-Eastern Australia*. Rigby: Dee Why West, NSW.
- IUCN (2001). IUCN Red List Categories: Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- Molyneux, W.M. (1993). A new species of *Callistemon* R. Br. (Myrtaceae) from East Gippsland. *Muelleria* 8: 61–64.
- Molyneux, W.M. (1997). Notes on *Callistemon* in East Gippsland, including the description of *C. genofluvialis* sp. nov. *Muelleria* 10: p 57–61.
- NATMAP (1982). Orbst Sheet 8522 (1:100,00), NATMAP, Canberra.
- Willis, J.H. (1973). *A Handbook to Plants in Victoria* p. 451, Melbourne University Press, Carlton.

Acacia derwentiana (Mimosaceae), a new species from southern Tasmania

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Abstract

Acacia derwentiana A.M.Gray, from the lower River Derwent catchment and two smaller eastern river systems, the Carlton and the Prosser, is newly described and illustrated, together with notes on its distribution, affinities and ecology.

Introduction

Landcare and revegetation projects in the lower Derwent River catchment during the late 1980s and 1990s promoted a high level of interest in the remnant natural vegetation resources of the valley. The present author was involved in a number of Landcare projects through the Greening Australia (Tasmania) organisation. In liaison with Mr Andrew Lawson, then Co-ordinator of The Upper Derwent Valley Landcare Group, investigations were made into reports of an *Acacia* species, thought to be *A. axillaris* Benth., from the valley of the River Clyde, a tributary of the Derwent. Hitherto that species had been recorded from a few catchments well to the north-east of the Derwent. This identity was subsequently verified. During the study a rather more pendulous form of what was also thought to be the species, or the closely related *A. riceana* Hensl., was noted from along the banks of the Derwent, the Clyde and other tributaries in the catchment. Further collections and comparisons with *A. axillaris* and *A. riceana* revealed significant distinctions between the three entities.

Coincidentally, a Hobart horticulturalist had propagated material of the novelty and has applied the cultivar name “*Acacia Derwent Cascade*” in reference to its pendulous habit and the locality of its collection, on the River Derwent, adjacent to a series of shallow cascades.

This discovery brings the number of indigenous species of *Acacia* found in Tasmania to 21, with four of these, i.e. *A. riceana*, *A. axillaris*, *A. pataczekii* D.I.Morris and *A. derwentiana* A.M.Gray, being endemic in the State.

Taxonomy

Acacia derwentiana A.M.Gray, *sp. nov.*

Ab *Acacia riceana* Hensl. phyllodiis non fasciculatis, alternis, late dispersis, ramis ultimatis penultimatisque, arcuatis vel interdum pendentibus incidentibus, et ab *Acacia axillare* Benth. inflorescentiis vulgo binatis, pedunculatis, elongato-cylindricis, 5–8(–15) flosculos in capitulis singularibus, sessilibus, compactis differt.

Type: Tasmania, River Derwent, 3 km west of the Plenty River Bridge, Plenty, 42° 43' S, 146° 55' E, 26 ix 2000, G. Kautylas and J. Jarman s.n. (holotypus HO 516628; isotypes MEL, NSW). Figure 1.

A small to medium *shrub*, 1–3(–5) m high, usually multi-branched from the base or with a short trunk, the branches semi-spreading to sub-erect, becoming very slender, arching and pendulous towards their extremities. Ultimate branchlets soft and often bronze to reddish in colour, older branchlets and smaller branches finely ridged, striated greyish to brown with appressed fine hairs, lenticellular. Canopy dark green and dense lower down, but rather more open in the upper parts. *Phyllodes* alternate, distantly



Figure 1: Type sheet of *Acacia derwentiana* A.M.Gray.

dispersed on the slender terminal branches, rather more crowded on the lower branches and on shorter axillary branchlets, usually borne singly at the nodes, never tightly clustered, linear to very narrowly elliptic, straight to slightly curved, 20–35(–65) mm long, 1–2(–2.5) mm wide (L:B ratio 12–20(–40):1); face of phyllode with three longitudinal veins, the central vein the most prominent, the two lateral veins sometimes obscure or apparently interrupted, anastomosing veins not visible; apex acute-acuminate, pungent; base gradually narrowed to a very short pulvinus, 0.5–1.0 mm long; gland on the adaxial margin minute, often absent, narrowly oval and seldom raised more than 1 mm above the margin. *Inflorescence* a loose cylindrical spike, 5–10–25 mm long on a peduncle (3–)5–8 mm long, single or, more usually, paired in the axils of the upper phyllodes; flowers 5–8(–15) per spike, confined to the upper half to two thirds of the floral axis, not crowded, the rachis usually visible between each flower. Sepals 4, united, light brown, the margins ciliate; petals 4, free, spreading, the lobes strongly recurved at anthesis; stamens pale yellow to almost lemon yellow. *Pod* linear, curved, irregularly constricted between the seeds, dark brown, 25–35(–50) mm long, 2–4 mm wide; seeds dark brown, lustrous, ellipsoid, arilate, the aril much folded, compressed, triangular, surmounting but not surrounding the seed. Flowering period: Oct.–Dec.

Additional specimens examined (all HO): **TASMANIA**: Sally Peak Rd, Buckland, “bank of rivulet”, 42° 37' S, 147° 43' E, *M. Allan*, 17 Mar. 1974 (42627); South bank of the River Derwent, near mouth of Glenfern Ck, 42° 45' S, 146° 59' E, *A. M. Buchanan* 1239, 20 Oct. 1983; Brushy Plains



Figure 2: Details of phyllode arrangements and inflorescences on ultimate branchlets of a: *A. derwentiana*, b: *A. riceana* and c: *A. axillaris* (all $\times 0.5$).

Rivulet., Buckland, 42° 37' S, 147° 43' E, *A. M. Buchanan* 13288, 10 Mar. 1993; Derwent River, near Triffits Neck, 42° 42' S, 146° 55' E, *A. M. Buchanan* 13551, 21 Feb. 1994; Tea Tree Rivulet, 42° 40' S, 147° 47' E, *P. Collier* 2700, 5 Sept. 1987; Repulse River, near Ouse, 42° 30' S, 146° 37' E, *P. Collier* 4091, 17 Sept. 1989; Broad River, near Cluny Lagoon, 42° 31' S, 146° 39' E, *P. Collier* 4259, 8 Oct. 1989; Bank of River Derwent, "Rylands", 42° 42' S, 146° 55' E, *A. M. Gray* 860, 13 Sept. 1998; Dawson Rd crossing, Broad River, 42° 30' S, 146° 40' E, *A. M. Gray* 918, 02 Jan. 1999; River Derwent, west bank, just S. of railway bridge, 42° 45' S, 146° 59' E, *A. M. Gray* 956, 958, 28 Apr. 1999; Tyenna River, Mill Lodge, 42° 41' S, 146° 50' E, *A. M. Gray* 962, 963, 28 Apr. 1999; Dawson Rd, near confluence of Broad River and Cluny Lagoon, 42° 31' S, 146° 39' E, *A. M. Gray* 1102, 10 May 2001; Cascades, Hobart, 42° 54' S, 147° 17' E, *L. Rodway*, Oct. 1889 (8778).

Notes: *Acacia derwentiana* superficially resembles both *A. axillaris* and *A. riceana*. *Acacia derwentiana* may be distinguished from *A. riceana* by the arrangement of the ultimate lateral branchlets and the presentation of the phyllodes.

In *A. riceana*, the ultimate lateral branchlets are usually < 5 mm in length, manifestly longitudinally compressed and the phyllodes borne thereupon appearing to be fasciculate or tightly bunched. As the branchlets mature, some may elongate as the internodes lengthen and other new axillary branchlets develop on these. A large proportion of the lateral branchlets do not lengthen as maturation proceeds but remain with the phyllodes tightly bunched, even on branches 3 years old or more.

In *A. derwentiana* and *A. axillaris*, the phyllodes are borne singly and well separated from one another; some new branchlets may have the phyllodes loosely clustered but never distinctly and consistently *fasciculate* as in *A. riceana* (see Fig. 2). As the branchlets mature, all internodes progressively lengthen and the phyllodes do not persist in clusters.

In *A. riceana*, the phyllode length to width ratio is within the range of c.10(–12):1, whereas in *A. derwentiana* it is c. 12–20(–40):1, and in *A. axillaris* the ratio is c. 15–25(–35):1.

Key to the *A. riceana* group:

1. Flowers 2–3(–5), crowded together in a single spherical head, 3–5 mm long; peduncle 1–3 mm long *A. axillaris*
- 1: Flowers (5–)8–15, usually in paired spikes; flowers widely dispersed along the distal 1/2 – 2/3 of the inflorescence, the rachis usually visible between the flowers; spike 8–25 mm long; peduncle 5–8 mm long 2
2. Phyllode length:width ratio 10(–12):1; phyllodes crowded together in groups of 3–6(–10), on lateral shoots and tightly clustered as to appear fasciculate; the majority of lateral shoots seldom lengthening *A. riceana*
- 2: Phyllode length:width ratio 12–20(–40):1; phyllodes usually well dispersed, seldom formed on very short lateral branchlets; the branchlets soon lengthening *A. derwentiana*

Discussion: In Court's (2001) treatment, he concludes that "the differences between *A. axillaris* and *A. riceana* are not pronounced but these taxa are here retained as different species". Court cites the relative dimensions of the inflorescences as the main character separating the two taxa, but makes no mention of the different arrangement of the phyllodes in each species, one of the more obvious differences, particularly when examined in the field as well as in herbarium specimens.

The habit of the two species does appear to differ, as Court also points out, *A. axillaris* being more or less erect compared with the often pendulous or arching younger branches of *A. riceana*. However, this pendulous habit is also a feature of *A. derwentiana*, but the widely spaced, non-clustered phyllodes of the latter species gives it quite a distinctive appearance in situ.

Although the three species are apparently closely related, each can be differentiated by a combination of reproductive and vegetative characters, which enable them to be separated with little confusion either in the field or the herbarium. Although populations of each taxon occur in the same geographical regions, none are known to be sympatric. For these reasons, the present author prefers to recognise three distinct taxa at specific level, rather than at sub-specific or varietal ranking.

Distribution and ecology: *Acacia derwentiana* is largely confined to the banks of the River Derwent, and some of its lower tributaries; it also occurs, infrequently, along the Carlton and Prosser Rivers and their tributaries. It is seldom encountered any further than 25 to 50 m from a river's edge and is more likely found within 5 m of the water's edge.

The species is a component of the humid corridor, mixed-species shrubberies along river banks, however it may also occur in riparian native grasslands and/or sedgeland. See distribution map in Figure 3.

Conservation status: Many of the riparian habitats favoured by this species are now much degraded and support a wide spectrum of introduced weed species, particularly the Crack Willow, *Salix fragilis* L. var. *fragilis*, and Blackberry, *Rubus fruticosus* L. It is apparently palatable to stock and may be severely grazed where cattle, in particular, have access to river banks.

Riparian habitats are prone to seasonal erosion or large-scale destruction during major flood episodes. These habitats are also increasingly subject to invasive weed threats, the

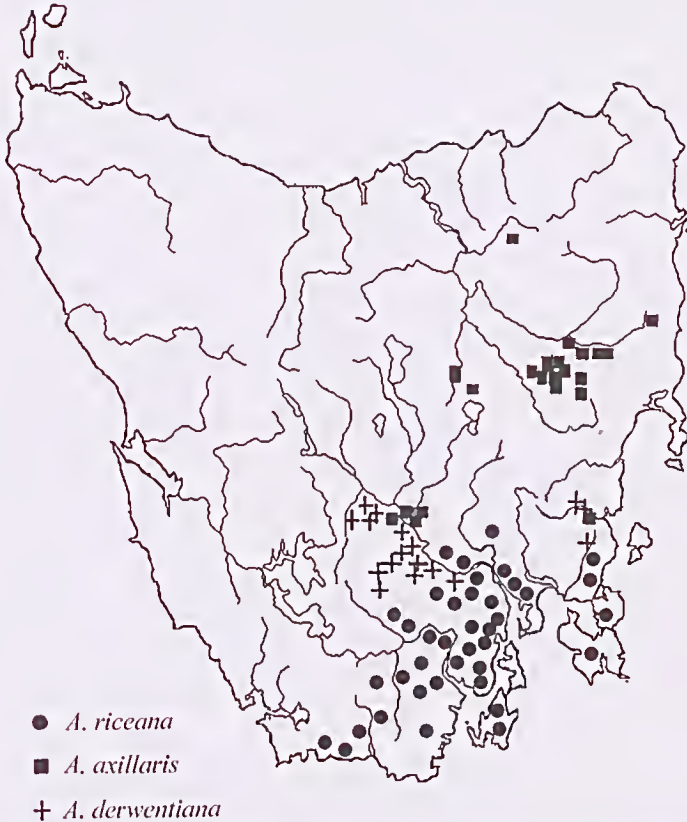


Figure 3: Geographical distribution of the *A. riceana* group as known from herbarium specimens.

control or eradication procedures for which may compromise associated natural vegetation. For these reasons this taxon may satisfy the criteria to be listed as *vulnerable* on the schedules of the *Tasmanian Threatened Species Protection Act 1995*.

Etymology: The specific name *derwentiana* is indicative of the species almost being confined to the catchment of the River Derwent in south-eastern Tasmania.

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References

- Court, A.B. (2001). *The Flora of Australia* IIB, pp 386-387. Australian Biological Resources Study, Canberra/CSIRO Publishing, Melbourne.

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